



Test Report



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Test report for: airmotec/Chromatotec
15 rue d'Artiguelongue
33240 Saint Antoine
France

For the attention of: Michel Robert

Instruments: Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)
Chromatotec GC 866 PID airToxic (Model A73022, serial number 0430309)
Chromatotec GC 866 PID airToxic (Model A73022, serial number 0720509)

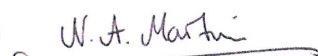
Work carried out by: N A Martin, S D Jarvis, S White, J J Helmore and O J Bevan

Reference: E09040018

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Checked by: 

Name: R A Robinson, on behalf of NPLML

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
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Appendix A Test programme

Appendix B Operating manuals supplied by the manufacturer

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

1. Synopsys with proposed scope of certification

1.1 Summary of test results

Table 0.1 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509).

Table 0.2 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509).

Table 0.3 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

Table 0.4 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

Table 0.5 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309).

Table 0.6 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309).

Table 0.7 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 0.8 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Tables 1 and 2 summarise respectively the results obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) and Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

Tables 3 and 4 summarise respectively the results obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) and Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 5 summarises the gases employed in the laboratory tests.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 0.1 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.5.3	Lack of fit, largest residual	$< \pm 5 \%$	2.54 %
8.5.5	Repeatability at $0.5 \mu\text{g m}^{-3}$	$< \pm 0.3 \mu\text{g m}^{-3}$	$0.20 \mu\text{g m}^{-3}$
8.5.5	Repeatability at limit value	$< \pm 5 \%$	1.42 %
8.5.9.1	Influence of the interference from ozone	$< \pm 5 \%$	1.25 %
8.5.9.4	Influence of the interference from sum of possible interfering organic compounds at span value	$< \pm 5 \%$	4.58 %
8.5.9.3	Influence of the interference from relative humidity	$< \pm 4 \%$	0.001 %
8.5.7	Sensitivity coefficient for the influence of surrounding temperature at span value	$< \pm 0.2 \% \text{ K}^{-1}$	$0.08 \% \text{ K}^{-1}$
8.5.6	Sensitivity coefficient for the influence of ambient pressure at span value	$< \pm 1 \% \text{ kPa}^{-1}$	$0.10 \% \text{ kPa}^{-1}$
8.5.8	Sensitivity coefficient for the influence of voltage a span value	$< \pm 0.2 \% \text{ V}^{-1}$	$0.010 \% \text{ V}^{-1}$
8.5.4	Short term drift (24 hours) at span value	$< \pm 5 \%$	0.15 %
8.5.10	Carry over	$< 0.5 \mu\text{g m}^{-3}$ of limit value for first analysis after the response time	$0.41 \mu\text{g m}^{-3}$

Table 0.2 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.6.8	Reproducibility standard deviation	$< \pm 0.25 \mu\text{g m}^{-3}$	$0.24 \mu\text{g m}^{-3}$
8.6.5	Long term drift at span value (14 days)	$< \pm 10 \%$	4.42 %
8.6.6	Maintenance interval	$> 14 \text{ days}$	90 days
8.6.7	Availability	$> 90 \%$	99.7 %

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 0.3 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.5.3	Lack of fit, largest residual	$< \pm 5 \%$	2.12 %
8.5.5	Repeatability at $0.5 \mu\text{g m}^{-3}$	$< \pm 0.3 \mu\text{g m}^{-3}$	$0.06 \mu\text{g m}^{-3}$
8.5.5	Repeatability at limit value	$< \pm 5 \%$	1.84 %
8.5.9.1	Influence of the interference from ozone	$< \pm 5 \%$	1.19 %
8.5.9.4	Influence of the interference from sum of possible interfering organic compounds at span value	$< \pm 5 \%$	3.87 %
8.5.9.3	Influence of the interference from relative humidity	$< \pm 4 \%$	0.001 %
8.5.7	Sensitivity coefficient for the influence of surrounding temperature at span value	$< \pm 0.2 \% \text{ K}^{-1}$	$0.03 \% \text{ K}^{-1}$
8.5.6	Sensitivity coefficient for the influence of ambient pressure at span value	$< \pm 1 \% \text{ kPa}^{-1}$	$0.18 \% \text{ kPa}^{-1}$
8.5.8	Sensitivity coefficient for the influence of voltage a span value	$< \pm 0.2 \% \text{ V}^{-1}$	$0.022 \% \text{ V}^{-1}$
8.5.4	Short term drift (24 hours) at span value	$< \pm 5 \%$	1.82 %
8.5.10	Carry over	$< 0.5 \mu\text{g m}^{-3}$ of limit value for first analysis after the response time	$0.36 \mu\text{g m}^{-3}$

Table 0.4 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.6.8	Reproducibility standard deviation	$< \pm 0.25 \mu\text{g m}^{-3}$	$0.24 \mu\text{g m}^{-3}$
8.6.5	Long term drift at span value (14 days)	$< \pm 10 \%$	1.54 %
8.6.6	Maintenance interval	$> 14 \text{ days}$	90 days
8.6.7	Availability	$> 90 \%$	96.3 %

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 0.5 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.5.3	Lack of fit, largest residual	$< \pm 5 \%$	4.60 %
8.5.5	Repeatability at $0.5 \mu\text{g m}^{-3}$	$< \pm 0.3 \mu\text{g m}^{-3}$	$0.02 \mu\text{g m}^{-3}$
8.5.5	Repeatability at limit value	$< \pm 5 \%$	3.74 %
8.5.9.1	Influence of the interference from ozone	$< \pm 5 \%$	0.87 %
8.5.9.4	Influence of the interference from sum of possible interfering organic compounds at span value	$< \pm 5 \%$	1.81 %
8.5.9.3	Influence of the interference from relative humidity	$< \pm 4 \%$	0.78 %
8.5.7	Sensitivity coefficient for the influence of surrounding temperature at span value	$< \pm 0.2 \% \text{ K}^{-1}$	$0.16 \% \text{ K}^{-1}$
8.5.6	Sensitivity coefficient for the influence of ambient pressure at span value	$< \pm 1 \% \text{ kPa}^{-1}$	$0.26 \% \text{ kPa}^{-1}$
8.5.8	Sensitivity coefficient for the influence of voltage a span value	$< \pm 0.2 \% \text{ V}^{-1}$	$0.031 \% \text{ V}^{-1}$
8.5.4	Short term drift (24 hours) at span value	$< \pm 5 \%$	0.96 %
8.5.10	Carry over	$< 0.5 \mu\text{g m}^{-3}$ of limit value for first analysis after the response time	$0.35 \mu\text{g m}^{-3}$

Table 0.6 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.6.8	Reproducibility standard deviation	$< \pm 0.25 \mu\text{g m}^{-3}$	$0.08 \mu\text{g m}^{-3}$
8.6.5	Long term drift at span value (14 days)	$< \pm 10 \%$	7.52 %
8.6.6	Maintenance interval	> 14 days	90 days
8.6.7	Availability	$> 90 \%$	100 %

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 0.7 summarises the **benzene laboratory results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.5.3	Lack of fit, largest residual	$< \pm 5 \%$	4.42 %
8.5.5	Repeatability at $0.5 \mu\text{g m}^{-3}$	$< \pm 0.3 \mu\text{g m}^{-3}$	$0.03 \mu\text{g m}^{-3}$
8.5.5	Repeatability at limit value	$< \pm 5 \%$	1.34 %
8.5.9.1	Influence of the interference from ozone	$< \pm 5 \%$	1.00 %
8.5.9.4	Influence of the interference from sum of possible interfering organic compounds at span value	$< \pm 5 \%$	2.81 %
8.5.9.3	Influence of the interference from relative humidity	$< \pm 4 \%$	1.16 %
8.5.7	Sensitivity coefficient for the influence of surrounding temperature at span value	$< \pm 0.2 \% \text{ K}^{-1}$	$0.10 \% \text{ K}^{-1}$
8.5.6	Sensitivity coefficient for the influence of ambient pressure at span value	$< \pm 1 \% \text{ kPa}^{-1}$	$0.15 \% \text{ kPa}^{-1}$
8.5.8	Sensitivity coefficient for the influence of voltage a span value	$< \pm 0.2 \% \text{ V}^{-1}$	$0.027 \% \text{ V}^{-1}$
8.5.4	Short term drift (24 hours) at span value	$< \pm 5 \%$	0.79 %
8.5.10	Carry over	$< 0.5 \mu\text{g m}^{-3}$ of limit value for first analysis after the response time	$0.37 \mu\text{g m}^{-3}$

Table 0.8 summarises the **benzene field results** obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Clause in Standard	Performance characteristic	Performance criterion	Test result
8.6.8	Reproducibility standard deviation	$< \pm 0.25 \mu\text{g m}^{-3}$	$0.08 \mu\text{g m}^{-3}$
8.6.5	Long term drift at span value (14 days)	$< \pm 10 \%$	4.68 %
8.6.6	Maintenance interval	$> 14 \text{ days}$	90 days
8.6.7	Availability	$> 90 \%$	99.9 %

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 1: Summary of test results performed on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	MCERTS pass/fail performance criterion: Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$, See table 7 column 5B for criteria for determinands other than benzene. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	0.20	0.50	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	MCERTS pass/fail performance criterion: Repeatability determined at the annual mean limit value for benzene, $r_{(LV)} < \pm 5 \%$ See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	1.42	4.98	Yes

COMMERCIAL IN CONFIDENCE

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene	benzene	0.14	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	MCERTS pass/fail performance criterion Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5 \%$ See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	0.15	44.6	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $B_v < \pm 1\%$ kPa⁻¹ Test is required to be carried out at the limit value, performance criterion expressed at this value.	benzene	0.10	5.01	Yes

COMMERCIAL IN CONFIDENCE

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	MCERTS pass/fail performance criterion Largest residual, $X_i < 5\%$ of the value of the input concentration	benzene	2.54	15.0	Yes

COMMERCIAL IN CONFIDENCE

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	MCERTS pass/fail performance criterion Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).	benzene	0.41	Zero Gas	Yes

COMMERCIAL IN CONFIDENCE

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	No MCERTS pass/fail performance criterion The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of $1 \mu\text{g m}^{-3}$ (0.30 ppb).	benzene	0.44	Zero Gas	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_v < 0.2 \% V^{-1}$	benzene	0.010	44.4	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.043	0.51	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{Ts} < 0.2 \% K^{-1}$	benzene	0.04	44.80	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.	benzene	1.87	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	MCERTS pass/fail performance criterion Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{O}_3} < 5 \%$	benzene	1.25	36.7	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	MCERTS pass/fail performance criterion Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$	benzene	0.001	43.16	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion Influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.49	0.49	N/A

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	MCERTS pass/fail performance criterion Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{org}} < 5 \%$	benzene	4.58	45.86	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene.	benzene	2.19	0.50	N/A

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	MCERTS pass/fail performance criterion Sensitivity coefficient for the long term drift at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $d_{14d} < \pm 10$ %. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	4.42	39.0	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	MCERTS pass/fail performance criterion				
	Maintenance interval, determined over the course of the field trial period, > 14d	benzene	90	N/A	Yes
	See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.				

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, $A_a > 90\%$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	99.7	N/A	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	MCERTS pass/fail performance criterion Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	0.24	Ambient Air	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	No MCERTS pass/fail performance criterion: Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$. See table 7 column 5B for criteria for determinands other than benzene. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane 2,2,4-trimethylpentane n-heptane toluene n-octane ethyl-benzene m-xylene and p-xylene o-xylene 1,3,5-trimethylbenzene 1,2,4-trimethylbenzene 1,2,3-trimethylbenzene	0.51 0.38 0.40 0.30 0.16 0.22 0.10 0.11 0.16 0.15 0.17	0.55 0.73 0.63 0.58 0.73 0.68 1.36 0.68 0.79 0.77 0.74	No Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
	Repeatability determined at the annual mean limit value for benzene, equivalent to 1.54 ppb. $R_{(L.V)} < \pm 5\%$. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.71	5.47	Yes
		2,2,4-trimethyl pentane	0.86	7.29	Yes
		n-heptane	0.69	6.28	Yes
		toluene	2.98	5.81	Yes
		n-octane	2.55	7.22	Yes
		ethyl-benzene	1.30	6.78	Yes
		m-xylene and p-xylene	2.07	13.5	Yes
		o-xylene	2.16	6.78	Yes
		1,3,5-trimethylbenzene	3.25	7.83	Yes
		1,2,4-trimethylbenzene	1.45	7.67	Yes
		1,2,3-trimethylbenzene.	2.14	7.31	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene, equivalent to 0.15 ppb. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.44	0.55	N/A
		2,2,4-trimethyl pentane	0.25	0.73	N/A
		n-heptane	0.30	0.63	N/A
		toluene	0.25	0.58	N/A
		n-octane	0.11	0.73	N/A
		ethyl-benzene	0.19	0.68	N/A
		m-xylene and p-xylene	0.18	1.36	N/A
		o-xylene	0.09	0.68	N/A
		1,3,5-trimethylbenzene	0.14	0.79	N/A
		1,2,4-trimethylbenzene	0.16	0.77	N/A
		1,2,3-trimethylbenzene.	0.21	0.74	N/A

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	No MCERTS pass/fail performance criterion				
	Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5\%$. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	1.08	49.0	Yes
		2,2,4-trimethyl pentane	1.23	65.2	Yes
		n-heptane	0.39	56.1	Yes
		toluene	2.10	52.0	Yes
		n-octane	3.54	64.7	Yes
		ethyl-benzene	1.65	60.9	Yes
		m-xylene and p-xylene	1.76	121.2	Yes
		o-xylene	1.59	59.9	Yes
		1,3,5-trimethylbenzene	1.48	65.6	Yes
		1,2,4-trimethylbenzene	1.62	64.8	Yes
		1,2,3-trimethylbenzene.	1.94	63.2	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) for benzene), $B_v < \pm 1\%$ kPa ⁻¹ . See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	n-hexane	0.21	5.50	Yes
		2,2,4-trimethyl pentane	0.21	7.33	Yes
		n-heptane	0.20	57.7	Yes
		toluene	0.11	53.1	Yes
		n-octane	0.21	7.26	Yes
		ethyl-benzene	0.19	6.83	Yes
		m-xylene and p-xylene	0.19	13.62	Yes
		o-xylene	0.19	6.74	Yes
		1,3,5-trimethylbenzene	0.18	7.27	Yes
		1,2,4-trimethylbenzene	0.19	7.29	Yes
		1,2,3-trimethylbenzene	0.08	7.10	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	MCERTS pass/fail performance criterion				
	Largest residual, $X_i < 5\%$ of the value of the input concentration.	n-hexane	3.75	5.39	Yes
		2,2,4-trimethyl pentane	1.75	36.4	Yes
		n-heptane	1.93	31.3	Yes
		toluene	3.21	29.0	Yes
		n-octane	3.27	36.1	Yes
		ethyl-benzene	2.06	34.0	Yes
		m-xylene and p-xylene	3.03	40.7	Yes
		o-xylene	4.02	20.1	Yes
		1,3,5-trimethylbenzene	2.09	36.0	Yes
		1,2,4-trimethylbenzene	2.26	36.2	Yes
		1,2,3-trimethylbenzene	2.49	35.3	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	No MCERTS pass/fail performance criterion				
	Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie $0.5 \mu\text{g m}^{-3}$ (0.15 ppb). See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.00	Zero Gas	Yes
		2,2,4-trimethyl pentane	0.00	Zero Gas	Yes
		n-heptane	0.28	Zero Gas	Yes
		toluene	0.96	Zero Gas	No
		n-octane	0.71	Zero Gas	Yes
		ethyl-benzene	1.19	Zero Gas	No
		m-xylene and p-xylene	2.93	Zero Gas	No
		o-xylene	1.76	Zero Gas	No
		1,3,5-trimethylbenzene	2.98	Zero Gas	No
		1,2,4-trimethylbenzene	5.83	Zero Gas	No
		1,2,3-trimethylbenzene	6.30	Zero Gas	No

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect) (continued)	No MCERTS pass/fail performance criterion				
	The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of $1 \mu\text{g m}^{-3}$ (0.30 ppb). See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.22	Zero Gas	Yes
		2,2,4-trimethyl pentane	0.19	Zero Gas	Yes
		n-heptane	0.46	Zero Gas	Yes
		toluene	1.35	Zero Gas	No
		n-octane	1.33	Zero Gas	Yes
		ethyl-benzene	2.07	Zero Gas	No
		m-xylene and p-xylene	5.07	Zero Gas	No
		o-xylene	3.15	Zero Gas	No
		1,3,5-trimethylbenzene	7.59	Zero Gas	No
		1,2,4-trimethylbenzene	10.4	Zero Gas	No
		1,2,3-trimethylbenzene	12.0	Zero Gas	No

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage over the range 220-240V at the span concentration value (between 70 % and 90 % of the certification range, 45 µg m ⁻³ , equivalent to 13.9 ppb) of benzene), $b_v < 0.2 \% V^{-1}$.	n-hexane	0.0024	48.7	Yes
		2,2,4-trimethyl pentane	0.0031	64.9	Yes
		n-heptane	0.00086	55.9	Yes
		toluene	0.0023	51.7	Yes
		n-octane	0.00002	60.5	Yes
		ethyl-benzene	0.0035	60.5	Yes
		m-xylene and p-xylene	0.0062	120.6	Yes
		o-xylene	0.0092	59.7	Yes
		1,3,5-trimethylbenzene	0.021	64.3	Yes
		1,2,4-trimethylbenzene	0.031	64.6	Yes
		1,2,3-trimethylbenzene	0.037	62.9	Yes
	See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.				

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage over the range 220-240V at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	n-hexane	0.00067	0.55	N/A
		2,2,4-trimethyl pentane	0.043	0.74	N/A
		n-heptane	0.023	0.64	N/A
		toluene	0.086	0.59	N/A
		n-octane	0.0018	0.73	N/A
		ethyl-benzene	0.081	0.69	N/A
		m-xylene and p-xylene	0.026	1.37	N/A
		o-xylene	0.085	0.69	N/A
		1,3,5-trimethylbenzene	0.032	0.79	N/A
		1,2,4-trimethylbenzene	0.045	0.78	N/A
		1,2,3-trimethylbenzene	0.069	0.74	N/A

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70% and 90% of the certification range) of benzene. $b_{T_s} < 0.2\% K^{-1}$ See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	n-hexane	0.08	49.17	Yes
		2,2,4-trimethyl pentane	0.10	65.58	Yes
		n-heptane	0.12	56.45	Yes
		toluene	NV*	52.22	NV*
		n-octane	0.08	64.95	Yes
		ethyl-benzene	0.12	61.06	Yes
		m-xylene and p-xylene	0.06	121.82	Yes
		o-xylene	0.24	60.26	No
		1,3,5-trimethylbenzene	0.08	65.00	Yes
		1,2,4-trimethylbenzene	0.08	65.20	Yes
		1,2,3-trimethylbenzene	0.03	63.53	Yes

*No value

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.	n-hexane	0.25	0.55	N/A
		2,2,4-trimethyl pentane	2.40	0.73	N/A
		n-heptane	2.08	0.63	N/A
		toluene	NV*	0.58	NV*
		n-octane	0.17	0.72	N/A
		ethyl-benzene	0.19	0.68	N/A
		m-xylene and p-xylene	0.25	1.35	N/A
		o-xylene	0.72	0.68	N/A
		1,3,5-trimethylbenzene	0.16	0.78	N/A
		1,2,4-trimethylbenzene	NV*	0.77	NV*
		1,2,3-trimethylbenzene	NV*	0.73	NV*
	See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.				

*No value

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	No MCERTS pass/fail performance criterion				
	Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{O_3} < 5 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	1.26	40.3	Yes
		2,2,4-trimethyl pentane	1.14	53.8	Yes
		n-heptane	1.14	46.3	Yes
		toluene	1.03	42.8	Yes
		n-octane	1.02	53.3	Yes
		ethyl-benzene	1.10	50.1	Yes
		m-xylene and p-xylene	1.12	99.9	Yes
		o-xylene	1.14	49.4	Yes
		1,3,5-trimethylbenzene	0.693	53.3	Yes
		1,2,4-trimethylbenzene	0.743	53.5	Yes
		1,2,3-trimethylbenzene	0.559	52.1	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	No MCERTS pass/fail performance criterion				
	Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.19	47.43	Yes
		2,2,4-trimethyl pentane	0.04	62.62	Yes
		n-heptane	0.01	54.28	Yes
		toluene	0.11	50.31	Yes
		n-octane	0.002	62.62	Yes
		ethyl-benzene	0.15	58.90	Yes
		m-xylene and p-xylene	0.06	117.33	Yes
		o-xylene	0.27	57.97	Yes
		1,3,5-trimethylbenzene	0.44	62.49	Yes
		1,2,4-trimethylbenzene	0.42	62.75	Yes
		1,2,3-trimethylbenzene	0.27	61.19	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion				
	Influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene.	n-hexane	0.04	0.54	N/A
		2,2,4-trimethyl pentane	1.03	0.72	N/A
		n-heptane	0.45	0.62	N/A
		toluene	0.58	0.57	N/A
		n-octane	0.83	0.71	N/A
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene	ethyl-benzene	0.52	0.67	N/A
		m-xylene and p-xylene	0.01	1.33	N/A
		o-xylene	0.23	0.66	N/A
		1,3,5-trimethylbenzene	0.32	0.71	N/A
		1,2,4-trimethylbenzene	2.73	0.71	N/A
		1,2,3-trimethylbenzene	1.94	0.69	N/A

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	No MCERTS pass/fail performance criterion				
	Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{corg}} < 5 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene	n-hexane	3.01	50.29	Yes
		2,2,4-trimethyl pentane	3.43	67.07	Yes
		n-heptane	3.32	57.75	Yes
		toluene	2.67	53.42	Yes
		n-octane	3.39	66.43	Yes
		ethyl-benzene	3.08	62.40	Yes
		m-xylene and p-xylene	3.22	124.31	Yes
		o-xylene	4.38	62.37	Yes
		1,3,5-trimethylbenzene	2.50	72.01	Yes
		1,2,4-trimethylbenzene	2.08	70.60	Yes
		1,2,3-trimethylbenzene	1.81	67.28	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion				
	Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene.	n-hexane	3.50	0.55	N/A
		2,2,4-trimethyl pentane	61.10	0.73	N/A
		n-heptane	816.8	0.63	N/A
		toluene	20.16	0.58	N/A
		n-octane	3.10	0.72	N/A
		ethyl-benzene	5.86	0.68	N/A
		m-xylene and p-xylene	1.24	1.36	N/A
		o-xylene	11.35	0.68	N/A
		1,3,5-trimethylbenzene	7.81	0.79	N/A
		1,2,4-trimethylbenzene	2.46	0.77	N/A
		1,2,3-trimethylbenzene	12.64	0.73	N/A

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	No MCERTS pass/fail performance criterion: Long term drift at $0.5 \mu\text{g m}^{-3}$, determined at the span concentration value (between 70 % and 90 % of the certification of benzene, $d_{14d} < \pm 10$ %). See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	4.42	42.7	Yes
		2,2,4-trimethyl pentane	3.93	57.0	Yes
		n-heptane	3.87	49.0	Yes
		toluene	3.50	45.4	Yes
		n-octane	3.89	56.4	Yes
		ethyl-benzene	4.76	53.0	Yes
		m-xylene and p-xylene	4.89	105.6	Yes
		o-xylene	4.83	53.0	Yes
		1,3,5-trimethylbenzene	7.02	61.2	Yes
		1,2,4-trimethylbenzene	7.20	60.0	Yes
		1,2,3-trimethylbenzene	7.06	57.2	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	No MCERTS pass/fail performance criterion	n-hexane	90	N/A	Yes
		2,2,4-trimethyl pentane	90	N/A	Yes
		n-heptane	90	N/A	Yes
	Maintenance interval, determined over the course of the field trial period, > 14d.	toluene	90	N/A	Yes
		n-octane	90	N/A	Yes
		ethyl-benzene	90	N/A	Yes
		m-xylene and p-xylene	90	N/A	Yes
	See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	o-xylene	90	N/A	Yes
		1,3,5-trimethylbenzene	90	N/A	Yes
		1,2,4-trimethylbenzene	90	N/A	Yes
		1,2,3-trimethylbenzene	90	N/A	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	No MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, > 90%. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	n-hexane	85.8	Ambient Air	No
		2,2,4-trimethyl pentane	67.5	Ambient Air	No
		n-heptane	77.7	Ambient Air	No
		toluene	100.0	Ambient Air	Yes
		n-octane	57.8	Ambient Air	No
		ethyl-benzene	96.8	Ambient Air	Yes
		m-xylene and p-xylene	99.8	Ambient Air	Yes
		o-xylene	99.5	Ambient Air	Yes
		1,3,5-trimethylbenzene	89.7	Ambient Air	No
		1,2,4-trimethylbenzene	99.9	Ambient Air	Yes
		1,2,3-trimethylbenzene	70.7	Ambient Air	No

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	No MCERTS pass/fail performance criterion	n-hexane	0.26	Ambient Air	No
		2,2,4-trimethyl pentane	0.23	Ambient Air	Yes
	Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$.	n-heptane	0.78	Ambient Air	No
		toluene	1.54	Ambient Air	No
		n-octane	1.33	Ambient Air	No
		ethyl-benzene	1.05	Ambient Air	No
		m-xylene and p-xylene	2.33	Ambient Air	No
	See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	o-xylene	0.42	Ambient Air	No
		1,3,5-trimethylbenzene	0.59	Ambient Air	No
		1,2,4-trimethylbenzene	2.54	Ambient Air	No
		1,2,3-trimethylbenzene	2.89	Ambient Air	No

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 2: Summary of test results performed on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	MCERTS pass/fail performance criterion: Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$, See table 7 column 5B for criteria for determinands other than benzene. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	0.06	0.50	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	MCERTS pass/fail performance criterion: Repeatability determined at the annual mean limit value for benzene, $r_{(LV)} < \pm 5 \%$ See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	1.84	4.98	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene	benzene	0.04	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	MCERTS pass/fail performance criterion Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5 \%$ See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	1.82	44.6	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $B_v < \pm 1\%$ kPa⁻¹ Test is required to be carried out at the limit value, performance criterion expressed at this value.	benzene	0.18	5.01	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	MCERTS pass/fail performance criterion Largest residual, $X_i < 5\%$ of the value of the input concentration	benzene	2.12	4.90	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	MCERTS pass/fail performance criterion				
	Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).	benzene	0.36	Zero Gas	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	No MCERTS pass/fail performance criterion The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of $1 \mu\text{g m}^{-3}$ (0.30 ppb).	benzene	0.43	Zero Gas	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the voltage over the range 220-240V at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_v < 0.2 \% V^{-1}$	benzene	0.022	44.4	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion	benzene	0.078	0.51	N/A
	Sensitivity coefficient for the influence of the voltage over the range 220-240V at 1/10 of the annual mean concentration limit value for benzene.				

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 /µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{Ts} < 0.2 \text{ \% K}^{-1}$	benzene	0.04	44.8	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 /µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.01	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	MCERTS pass/fail performance criterion Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{O}_3} < 5 \%$	benzene	1.18	36.7	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	MCERTS pass/fail performance criterion Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$	benzene	0.001	43.16	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion Influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.13	0.49	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	MCERTS pass/fail performance criterion Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{corg}} < 5 \%$	benzene	3.87	45.86	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene.	benzene	15.48	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	MCERTS pass/fail performance criterion Sensitivity coefficient for the long term drift at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $d_{14d} < \pm 10$ %. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	1.54	39.0	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	MCERTS pass/fail performance criterion	benzene	90	N/A	Yes
	Maintenance interval, determined over the course of the field trial period, > 14d.				
	See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.				

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, $A_a > 90\%$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	99.8	Ambient Air	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	MCERTS pass/fail performance criterion Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	0.24	Ambient Air	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	No MCERTS pass/fail performance criterion:				
	Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$, see table 7 column 5B for criteria for determinands other than benzene.	n-hexane	0.26	0.55	Yes
		2,2,4-trimethyl pentane	0.23	0.73	Yes
		n-heptane	0.78	0.63	No
		toluene	1.54	0.58	No
		n-octane	1.33	0.73	No
		ethyl-benzene	1.05	0.68	No
		m-xylene and p-xylene	2.33	1.36	No
	See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	o-xylene	0.42	0.68	No
		1,3,5-trimethylbenzene	0.59	0.79	No
		1,2,4-trimethylbenzene	2.54	0.77	No
		1,2,3-trimethylbenzene	2.89	0.74	No

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
	Repeatability determined at the annual mean limit value for benzene, equivalent to 1.54 ppb. $R_{(L.V)} < \pm 5\%$. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	1.01	5.47	Yes
		2,2,4-trimethyl pentane	1.19	7.29	Yes
		n-heptane	1.37	6.28	Yes
		toluene	2.25	5.81	Yes
		n-octane	1.51	7.22	Yes
		ethyl-benzene	1.43	6.78	Yes
		m-xylene and p-xylene	1.45	13.5	Yes
		o-xylene	1.40	6.78	Yes
		1,3,5-trimethylbenzene	2.22	7.83	Yes
		1,2,4-trimethylbenzene	3.03	7.67	Yes
		1,2,3-trimethylbenzene.	1.71	7.31	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene, equivalent to 0.15 ppb. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.02	0.55	N/A
		2,2,4-trimethyl pentane	0.05	0.73	N/A
		n-heptane	0.03	0.64	N/A
		toluene	0.05	0.59	N/A
		n-octane	0.03	0.73	N/A
		ethyl-benzene	0.04	0.68	N/A
		m-xylene and p-xylene	0.07	1.36	N/A
		o-xylene	0.01	0.68	N/A
		1,3,5-trimethylbenzene	0.02	0.77	N/A
		1,2,4-trimethylbenzene	0.09	0.77	N/A
		1,2,3-trimethylbenzene.	0.18	0.77	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	No MCERTS pass/fail performance criterion				
	Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5 \%$. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	1.81	49.0	Yes
		2,2,4-trimethyl pentane	2.00	65.2	Yes
		n-heptane	2.14	56.1	Yes
		toluene	1.36	52.0	Yes
		n-octane	2.06	64.7	Yes
		ethyl-benzene	1.97	60.9	Yes
		m-xylene and p-xylene	2.03	121.2	Yes
		o-xylene	2.05	59.9	Yes
		1,3,5-trimethylbenzene	1.98	64.6	Yes
		1,2,4-trimethylbenzene	1.78	64.8	Yes
		1,2,3-trimethylbenzene.	1.63	63.2	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) for benzene), $B_v < \pm 1\%$ kPa ⁻¹ . See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	n-hexane	NV*	5.50	NV*
		2,2,4-trimethyl pentane	0.20	7.33	Yes
		n-heptane	0.46	6.31	Yes
		toluene	0.10	5.84	Yes
		n-octane	0.21	7.26	Yes
		ethyl-benzene	0.18	6.83	Yes
		m-xylene and p-xylene	0.18	13.62	Yes
		o-xylene	0.17	6.74	Yes
		1,3,5-trimethylbenzene	0.17	7.27	Yes
		1,2,4-trimethylbenzene	0.25	7.29	Yes
		1,2,3-trimethylbenzene	0.07	7.10	Yes

*No value

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	No MCERTS pass/fail performance criterion				
	Largest residual, X_i < 5 % of the value of the input concentration.	n-hexane	1.28	27.3	Yes
		2,2,4-trimethyl pentane	1.62	36.4	Yes
		n-heptane	1.59	6.20	Yes
		toluene	4.04	5.70	Yes
		n-octane	1.61	36.1	Yes
		ethyl-benzene	1.31	34.0	Yes
		m-xylene and p-xylene	2.48	40.7	Yes
		o-xylene	3.20	20.1	Yes
		1,3,5-trimethylbenzene	1.51	36.0	Yes
		1,2,4-trimethylbenzene	1.63	36.2	Yes
		1,2,3-trimethylbenzene	1.72	35.3	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	No MCERTS pass/fail performance criterion				
	Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb). See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.20	Zero Gas	Yes
		2,2,4-trimethyl pentane	0.22	Zero Gas	Yes
		n-heptane	0.30	Zero Gas	Yes
		toluene	1.03	Zero Gas	No
		n-octane	0.67	Zero Gas	Yes
		ethyl-benzene	1.12	Zero Gas	No
		m-xylene and p-xylene	2.80	Zero Gas	No
		o-xylene	1.45	Zero Gas	No
		1,3,5-trimethylbenzene	3.20	Zero Gas	No
		1,2,4-trimethylbenzene	5.15	Zero Gas	No
		1,2,3-trimethylbenzene	6.15	Zero Gas	No

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect) (continued)	No MCERTS pass/fail performance criterion				
	The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of $1 \mu\text{g m}^{-3}$ (0.30 ppb). See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.25	Zero Gas	Yes
		2,2,4-trimethyl pentane	0.27	Zero Gas	Yes
		n-heptane	0.44	Zero Gas	Yes
		toluene	1.23	Zero Gas	No
		n-octane	1.13	Zero Gas	Yes
		ethyl-benzene	1.95	Zero Gas	No
		m-xylene and p-xylene	4.80	Zero Gas	No
		o-xylene	2.97	Zero Gas	No
		1,3,5-trimethylbenzene	7.21	Zero Gas	No
		1,2,4-trimethylbenzene	9.69	Zero Gas	No
		1,2,3-trimethylbenzene	11.7	Zero Gas	No

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage over the range 220-240V at the span concentration value (between 70 % and 90 % of the certification range, 45 µg m ⁻³ , equivalent to 13.9 ppb) of benzene), $b_v < 0.2 \% V^{-1}$.	n-hexane	0.023	48.7	Yes
		2,2,4-trimethyl pentane	0.025	64.9	Yes
		n-heptane	0.023	55.9	Yes
		toluene	0.020	51.7	Yes
		n-octane	0.021	64.3	Yes
		ethyl-benzene	0.015	60.45	Yes
		m-xylene and p-xylene	0.014	120.6	Yes
		o-xylene	0.013	59.7	Yes
		1,3,5-trimethylbenzene	0.00053	64.3	Yes
		1,2,4-trimethylbenzene	0.0088	64.6	Yes
	See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	1,2,3-trimethylbenzene	0.012	62.9	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage over the range 220-240V at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	n-hexane	0.022	0.55	N/A
		2,2,4-trimethyl pentane	0.033	0.74	N/A
		n-heptane	0.022	0.64	N/A
		toluene	0.016	0.59	N/A
		n-octane	0.018	0.73	N/A
		ethyl-benzene	0.0080	0.69	N/A
		m-xylene and p-xylene	0.024	1.37	N/A
		o-xylene	0.017	0.69	N/A
		1,3,5-trimethylbenzene	0.0014	0.79	N/A
		1,2,4-trimethylbenzene	0.018	0.78	N/A
		1,2,3-trimethylbenzene	0.42	0.74	N/A

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70% and 90% of the certification range) of benzene. $b_{T_s} < 0.2\% K^{-1}$	n-hexane	0.03	49.17	Yes
		2,2,4-trimethyl pentane	0.02	65.58	Yes
		n-heptane	0.02	56.45	Yes
		toluene	0.001	52.22	Yes
		n-octane	0.02	64.95	Yes
		ethyl-benzene	0.06	61.06	Yes
		m-xylene and p-xylene	0.18	121.82	Yes
		o-xylene	0.42	60.26	No
		1,3,5-trimethylbenzene	0.01	65.00	Yes
	See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	1,2,4-trimethylbenzene	0.01	65.20	Yes
		1,2,3-trimethylbenzene	0.03	63.53	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.	n-hexane	0.24	0.55	N/A
		2,2,4-trimethyl pentane	0.97	0.73	N/A
		n-heptane	0.28	0.63	N/A
		toluene	0.23	0.58	N/A
		n-octane	0.26	0.72	N/A
		ethyl-benzene	0.18	0.68	N/A
		m-xylene and p-xylene	0.16	1.35	N/A
		o-xylene	0.12	0.68	N/A
		1,3,5-trimethylbenzene	0.04	0.78	N/A
		1,2,4-trimethylbenzene	0.04	0.77	N/A
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	1,2,3-trimethylbenzene	1.99	0.73	N/A

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	No MCERTS pass/fail performance criterion				
	Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{O_3} < 5 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	1.19	40.3	Yes
		2,2,4-trimethyl pentane	1.10	53.8	Yes
		n-heptane	1.15	46.3	Yes
		toluene	1.14	42.8	Yes
		n-octane	1.03	53.3	Yes
		ethyl-benzene	1.00	50.1	Yes
		m-xylene and p-xylene	1.28	99.9	Yes
		o-xylene	2.12	49.4	Yes
		1,3,5-trimethylbenzene	0.14	53.3	Yes
		1,2,4-trimethylbenzene	0.19	53.5	Yes
		1,2,3-trimethylbenzene	0.22	52.1	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	No MCERTS pass/fail performance criterion				
	Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	0.19	47.43	Yes
		2,2,4-trimethyl pentane	0.04	62.62	Yes
		n-heptane	0.01	54.28	Yes
		toluene	0.11	50.31	Yes
		n-octane	0.002	62.62	Yes
		ethyl-benzene	0.15	58.90	Yes
		m-xylene and p-xylene	0.06	117.33	Yes
		o-xylene	0.25	57.97	Yes
		1,3,5-trimethylbenzene	0.45	62.49	Yes
		1,2,4-trimethylbenzene	0.41	62.75	Yes
		1,2,3-trimethylbenzene	0.26	61.19	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion				
	Influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene.	n-hexane	0.19	0.54	N/A
		2,2,4-trimethyl pentane	0.54	0.72	N/A
		n-heptane	0.64	0.62	N/A
		toluene	0.48	0.57	N/A
		n-octane	0.86	0.71	N/A
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene	ethyl-benzene	0.69	0.67	N/A
		m-xylene and p-xylene	0.64	1.33	N/A
		o-xylene	0.21	0.66	N/A
		1,3,5-trimethylbenzene	0.02	0.71	N/A
		1,2,4-trimethylbenzene	2.46	0.71	N/A
		1,2,3-trimethylbenzene	NV*	0.69	NV*

*No value

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	No MCERTS pass/fail performance criterion				
	Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{c_{org}} < 5 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene	n-hexane	2.91	50.29	Yes
		2,2,4-trimethyl pentane	2.61	67.07	Yes
		n-heptane	1.77	57.75	Yes
		toluene	2.85	53.42	Yes
		n-octane	2.95	66.43	Yes
		ethyl-benzene	2.89	62.40	Yes
		m-xylene and p-xylene	2.76	124.31	Yes
		o-xylene	2.85	62.37	Yes
		1,3,5-trimethylbenzene	2.30	72.01	Yes
		1,2,4-trimethylbenzene	2.00	70.60	Yes
		1,2,3-trimethylbenzene	1.80	67.28	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion				
	Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene	n-hexane	4.66	0.55	N/A
		2,2,4-trimethyl pentane	57.83	0.73	N/A
		n-heptane	615.5	0.64	N/A
		toluene	2.40	0.59	N/A
		n-octane	1.16	0.73	N/A
		ethyl-benzene	1.83	0.68	N/A
		m-xylene and p-xylene	3.09	1.36	N/A
		o-xylene	2.63	0.68	N/A
		1,3,5-trimethylbenzene	3.72	0.77	N/A
		1,2,4-trimethylbenzene	5.18	0.77	N/A
		1,2,3-trimethylbenzene	13.09	0.77	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	No MCERTS pass/fail performance criterion: Long term drift at $0.5 \mu\text{g m}^{-3}$, determined at the span concentration value (between 70 % and 90 % of the certification of benzene, $d_{14d} < \pm 10$ %). See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	n-hexane	1.09	42.7	Yes
		2,2,4-trimethyl pentane	1.00	57.0	Yes
		n-heptane	0.88	49.0	Yes
		toluene	3.90	45.4	Yes
		n-octane	0.93	56.4	Yes
		ethyl-benzene	1.29	53.0	Yes
		m-xylene and p-xylene	0.95	105.6	Yes
		o-xylene	1.32	53.0	Yes
		1,3,5-trimethylbenzene	0.87	61.2	Yes
		1,2,4-trimethylbenzene	1.43	60.0	Yes
		1,2,3-trimethylbenzene	1.66	57.2	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	No MCERTS pass/fail performance criterion	n-hexane	90	N/A	Yes
		2,2,4-trimethyl pentane	90	N/A	Yes
		n-heptane	90	N/A	Yes
	Maintenance interval, determined over the course of the field trial period, > 14d.	toluene	90	N/A	Yes
		n-octane	90	N/A	Yes
		ethyl-benzene	90	N/A	Yes
		m-xylene and p-xylene	90	N/A	Yes
	See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	o-xylene	90	N/A	Yes
		1,3,5-trimethylbenzene	90	N/A	Yes
		1,2,4-trimethylbenzene	90	N/A	Yes
		1,2,3-trimethylbenzene	90	N/A	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	No MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, > 90 %. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	n-hexane	96.8	Ambient Air	Yes
		2,2,4-trimethyl pentane	99.5	Ambient Air	Yes
		n-heptane	89.7	Ambient Air	No
		toluene	99.9	Ambient Air	Yes
		n-octane	70.7	Ambient Air	No
		ethyl-benzene	96.8	Ambient Air	Yes
		m-xylene and p-xylene	99.8	Ambient Air	Yes
		o-xylene	99.5	Ambient Air	Yes
		1,3,5-trimethylbenzene	89.7	Ambient Air	No
		1,2,4-trimethylbenzene	99.9	Ambient Air	Yes
		1,2,3-trimethylbenzene	70.7	Ambient Air	No

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	No MCERTS pass/fail performance criterion	n-hexane	0.26	Ambient Air	No
		2,2,4-trimethyl pentane	0.23	Ambient Air	Yes
	Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$.	n-heptane	0.78	Ambient Air	No
		toluene	1.54	Ambient Air	No
		n-octane	1.33	Ambient Air	No
		ethyl-benzene	1.05	Ambient Air	No
		m-xylene and p-xylene	2.33	Ambient Air	No
	See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	o-xylene	0.42	Ambient Air	No
		1,3,5-trimethylbenzene	0.59	Ambient Air	No
		1,2,4-trimethylbenzene	2.54	Ambient Air	No
		1,2,3-trimethylbenzene	2.89	Ambient Air	No

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 3: Summary of test results performed on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309)

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	MCERTS pass/fail performance criterion: Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$ see table 7 column 5B for criteria for determinands other than benzene. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	0.02	0.50	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	MCERTS pass/fail performance criterion: Repeatability determined at the annual mean limit value for benzene, $r_{(LV)} < \pm 5 \%$ See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	3.74	4.98	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene	benzene	0.02	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	MCERTS pass/fail performance criterion Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5 \%$ See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	0.96	44.6	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $B_v < \pm 1\%$ kPa⁻¹ Test is required to be carried out at the limit value, performance criterion expressed at this value.	benzene	0.26	5.01	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	MCERTS pass/fail performance criterion Largest residual, $X_i < 5\%$ of the value of the input concentration	benzene	4.60	15.0	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	MCERTS pass/fail performance criterion Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).	benzene	0.35	Zero Gas	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect) (continued)	No MCERTS pass/fail performance criterion The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 1 $\mu\text{g m}^{-3}$ (0.30 ppb).	benzene	0.42	Zero Gas	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the voltage over the range 220-240V at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_v < 0.2 \% V^{-1}$	benzene	0.031	44.4	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion				
	Determine sensitivity coefficient for the influence of the voltage over the range 220-240V at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.060	0.51	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{Ts} < 0.2 \text{ \% K}^{-1}$	benzene	0.16	44.80	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.002	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	MCERTS pass/fail performance criterion Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{O}_3} < 5 \%$	benzene	0.87	36.7	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	MCERTS pass/fail performance criterion Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$	benzene	0.78	43.16	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion Influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene.	benzene	1.19	0.49	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	MCERTS pass/fail performance criterion Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{c_{org}} < 5 \%$	benzene	1.81	45.86	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene.	benzene	5.44	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	MCERTS pass/fail performance criterion Sensitivity coefficient for the long term drift at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $d_{14d} < \pm 10$ %. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	7.52	39.0	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	MCERTS pass/fail performance criterion	benzene	90	N/A	Yes
	Maintenance interval, determined over the course of the field trial period, > 14d.				
	See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.				

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, $A_a > 90\%$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	100.0	Ambient Air	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	MCERTS pass/fail performance criterion Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	0.08	Ambient Air	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	No MCERTS pass/fail performance criterion: Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$. See table 7 column 5B for criteria for determinands other than benzene. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene ethyl-benzene m-xylene and p-xylene o-xylene	0.02 0.03 0.04 0.03	0.58 0.68 1.36 0.68	Yes Yes Yes Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion: Repeatability determined at the annual mean limit value for benzene, $r_{(LV)} < \pm 5 \%$. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene ethyl-benzene m-xylene and p-xylene o-xylene	4.20 3.84 2.28 3.57	5.81 6.78 13.5 6.78	Yes Yes Yes Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene	toluene	0.02	0.58	N/A
		ethyl-benzene	0.03	0.68	N/A
		m-xylene and p-xylene	0.09	1.36	N/A
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	o-xylene	0.04	0.68	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	No MCERTS pass/fail performance criterion				
	Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5 \%$.	toluene	2.01	52.0	Yes
		ethyl-benzene	4.02	60.9	Yes
		m-xylene and p-xylene	4.20	121	Yes
		o-xylene	4.63	59.9	Yes
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	No MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $B_v < \pm 1\% \text{ kPa}^{-1}$. See Column 5 for corresponding concentration values in µg m⁻³ for determinands other than benzene.	toluene ethyl-benzene m-xylene and p-xylene o-xylene	0.10 0.24 0.19 0.17	5.84 6.83 13.62 6.74	Yes Yes Yes Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	No MCERTS pass/fail performance criterion				
	Largest residual, X_i < 5 % of the value of the input concentration.	toluene	3.82	29.0	Yes
		ethyl-benzene	4.73	34.0	Yes
		m-xylene and p-xylene	4.69	67.6	Yes
		o-xylene	4.99	46.8	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	No MCERTS pass/fail performance criterion				
	Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).	toluene	1.30	Zero Gas	No
		ethyl-benzene	1.29	Zero Gas	No
		m-xylene and p-xylene	4.02	Zero Gas	No
		o-xylene	1.51	Zero Gas	No
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect) (continued)	No MCERTS pass/fail performance criterion				
	The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of $1 \mu\text{g m}^{-3}$ (0.30 ppb).	toluene	1.50	Zero Gas	No
		ethyl-benzene	1.90	Zero Gas	No
		m-xylene and p-xylene	5.75	Zero Gas	No
		o-xylene	2.30	Zero Gas	No
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage over the range 220-240V at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_v < 0.2 \% V^{-1}$. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	toluene	0.027	43.8	Yes
		ethyl-benzene	0.025	44.5	Yes
		m-xylene and p-xylene	0.022	88.7	Yes
		o-xylene	0.027	43.9	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion				
	Determine sensitivity coefficient for the influence of the voltage over the range 220-240V at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	toluene	0.048	0.50	N/A
		ethyl-benzene	0.011	0.51	N/A
		m-xylene and p-xylene	0.0032	1.01	N/A
		o-xylene	0.082	0.51	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{Ts} < 0.2 \% K^{-1}$. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	toluene	0.76	42.22	No
		ethyl-benzene	1.75	61.06	No
		m-xylene and p-xylene	1.66	121.82	No
		o-xylene	1.63	60.26	No

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.	toluene	0.72	0.58	N/A
		ethyl-benzene	1.29	0.68	N/A
		m-xylene and p-xylene	1.30	1.35	N/A
		o-xylene	1.34	0.68	N/A
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	No MCERTS pass/fail performance criterion				
	Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{O}_3} < 5 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene	0.74	36.3	Yes
		ethyl-benzene	1.98	36.8	Yes
		m-xylene and p-xylene	0.76	73.5	Yes
		o-xylene	0.51	36.3	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	No MCERTS pass/fail performance criterion				
	Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$.	toluene	0.83	50.31	Yes
		ethyl-benzene	0.70	58.90	Yes
		m-xylene and p-xylene	0.64	117.33	Yes
		o-xylene	0.66	57.98	Yes
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion				
	Influence of the	toluene	0.43	0.57	N/A
	interference from relative	ethyl-benzene	0.63	0.67	N/A
	humidity at 1/10 of the	m-xylene and p-xylene	0.81	1.33	N/A
	annual mean concentration limit value for benzene.	o-xylene	1.04	0.66	N/A
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	No MCERTS pass/fail performance criterion				
	Influence of the	toluene	4.44	53.42	Yes
	interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{Org}} < 5 \%$.	ethyl-benzene	2.98	62.40	Yes
		m-xylene and p-xylene	2.49	124.3	Yes
		o-xylene	2.81	62.37	Yes
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion				
	Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene	3.14	0.59	N/A
		ethyl-benzene	2.66	0.68	N/A
		m-xylene and p-xylene	2.81	0.68	N/A
		o-xylene	4.21	0.68	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	No MCERTS pass/fail performance criterion:	toluene	5.47	45.4	Yes
	Long term drift at $0.5 \mu\text{g m}^{-3}$, determined at the span concentration value (between 70 % and 90 % of the certification of benzene, $d_{14d} < \pm 10$ %).	ethyl-benzene	5.55	53.0	Yes
		m-xylene and p-xylene	4.93	105.6	Yes
		o-xylene	5.48	53.0	Yes
	See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	No MCERTS pass/fail performance criterion Maintenance interval, determined over the course of the field trial period, > 14d. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	toluene	90	N/A	Yes
		ethyl-benzene	90	N/A	Yes
		m-xylene and p-xylene	90	N/A	Yes
		o-xylene	90	N/A	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	No MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, > 90 %. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	toluene	99.9	Ambient Air	Yes
		ethyl-benzene	96.1	Ambient Air	Yes
		m-xylene and p-xylene	99.9	Ambient Air	Yes
		o-xylene	98.8	Ambient Air	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	No MCERTS pass/fail performance criterion	toluene	0.19	Ambient Air	Yes
		ethyl-benzene	0.38	Ambient Air	No
		m-xylene and p-xylene	0.22	Ambient Air	Yes
	Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	o-xylene	0.14	Ambient Air	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 4: Summary of test results performed on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	MCERTS pass/fail performance criterion: Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$ see table 7 column 5B for criteria for determinands other than benzene. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	0.03	0.50	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	MCERTS pass/fail performance criterion: Repeatability determined at the annual mean limit value for benzene, $r_{(LV)} < \pm 5 \%$ See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$	benzene	1.34	4.98	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene	benzene	0.02	0.50	N/A

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	MCERTS pass/fail performance criterion Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5 \%$	benzene	0.79	44.6	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $B_v < \pm 1\%$ kPa⁻¹ Test is required to be carried out at the limit value, performance criterion expressed at this value.	benzene	0.15	5.01	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	MCERTS pass/fail performance criterion Largest residual, $X_i < 5\%$ of the value of the input concentration	benzene	4.42	15.0	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	MCERTS pass/fail performance criterion Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).	benzene	0.35	Zero Gas	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect) (continued)	No MCERTS pass/fail performance criterion The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 1 $\mu\text{g m}^{-3}$ (0.30 ppb).	benzene	0.42	Zero Gas	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the voltage over the range 220-240V at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_v < 0.2 \% V^{-1}$	benzene	0.027	44.4	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion Determine sensitivity coefficient for the influence of the voltage over the range 220-240V at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.060	0.51	N/A

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{Ts} < 0.2 \text{ \% K}^{-1}$	benzene	0.10	44.80	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.43	0.50	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	MCERTS pass/fail performance criterion Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{O}_3} < 5 \%$	benzene	1.00	36.7	Yes

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	MCERTS pass/fail performance criterion Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$	benzene	1.16	43.16	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion Influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene.	benzene	0.14	0.49	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	MCERTS pass/fail performance criterion Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{c_{org}} < 5 \%$	benzene	2.81	45.86	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion	benzene	1.56	0.50	N/A
	Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene.				

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	MCERTS pass/fail performance criterion Sensitivity coefficient for the long term drift at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $d_{14d} < \pm 10$ %. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	4.68	39.0	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	MCERTS pass/fail performance criterion Maintenance interval, determined over the course of the field trial period, > 14d. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	90	N/A	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, $A_a > 90\%$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	99.9	Ambient Air	Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	MCERTS pass/fail performance criterion Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	benzene	0.08	Ambient Air	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability	No MCERTS pass/fail performance criterion: Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene, $r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$. See table 7 column 5B for criteria for determinands other than benzene. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene ethyl-benzene m-xylene and p-xylene o-xylene	0.03 0.01 0.02 0.05	0.58 0.68 1.36 0.68	Yes Yes Yes Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion: Repeatability determined at the annual mean limit value for benzene, $r_{(LV)} < \pm 5 \%$. See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene ethyl-benzene m-xylene and p-xylene o-xylene	1.74 2.06 1.20 2.44	5.81 6.78 13.5 6.78	Yes Yes Yes Yes

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B1. Repeatability (continued)	No MCERTS pass/fail performance criterion:				
Detection limit	Calculation determined at 1/10 of the annual mean limit for benzene.	toluene	0.03	0.58	N/A
		ethyl-benzene	0.01	0.68	N/A
		m-xylene and p-xylene	0.04	1.36	N/A
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	o-xylene	0.05	0.68	N/A

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B2. Short term drift	No MCERTS pass/fail performance criterion				
	Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene, $d_{24h} < \pm 5 \%$.	toluene	2.58	52.0	Yes
		ethyl-benzene	3.86	60.9	Yes
		m-xylene and p-xylene	3.90	121.2	Yes
		o-xylene	3.41	59.9	Yes
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % kPa ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B3. Dependence on sample gas pressure	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $B_v < \pm 1\%$ kPa ⁻¹ .	toluene	0.01	5.84	Yes
		ethyl-benzene	0.18	6.83	Yes
		m-xylene and p-xylene	0.13	13.62	Yes
		o-xylene	0.10	6.74	Yes
	See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B4. Lack of fit (linearity)	No MCERTS pass/fail performance criterion				
	Largest residual, X_i < 5 % of the value of the input concentration.	toluene	2.29	5.72	Yes
		ethyl-benzene	3.38	6.69	Yes
		m-xylene and p-xylene	4.84	67.6	Yes
		o-xylene	8.72	20.1	No

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect)	No MCERTS pass/fail performance criterion				
	Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).	toluene	1.30	Zero Gas	No
		ethyl-benzene	1.29	Zero Gas	No
		m-xylene and p-xylene	4.02	Zero Gas	No
		o-xylene	1.51	Zero Gas	No
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B5. Carry-over (memory effect) (continued)	No MCERTS pass/fail performance criterion				
	The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of $1 \mu\text{g m}^{-3}$ (0.30 ppb). See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene	1.50	Zero Gas	Yes
		ethyl-benzene	1.90	Zero Gas	No
		m-xylene and p-xylene	5.75	Zero Gas	No
		o-xylene	2.30	Zero Gas	No

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the voltage over the range 220-240V at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_v < 0.2 \% V^{-1}$. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	toluene	0.020	43.8	Yes
		ethyl-benzene	0.018	44.5	Yes
		m-xylene and p-xylene	0.014	88.7	Yes
		o-xylene	0.024	43.9	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % V ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B6. Dependence on voltage (continued)	No MCERTS pass/fail performance criterion				
	Determine sensitivity coefficient for the influence of the voltage over the range 220-240V at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	toluene	0.037	0.50	N/A
		ethyl-benzene	0.0081	0.51	N/A
		m-xylene and p-xylene	0.0040	1.01	N/A
		o-xylene	0.070	0.51	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{Ts} < 0.2 \% K^{-1}$. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	toluene	0.83	52.22	No
		ethyl-benzene	1.79	61.06	No
		m-xylene and p-xylene	1.79	121.82	No
		o-xylene	1.72	60.26	No

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / % K ⁻¹	Column 5 / µg m ⁻³	Performance characteristic met
B7. Dependence on surrounding air temperature (Range selected: 18 °C to 24 °C) (continued)	No MCERTS pass/fail performance criterion				
	Sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in µg m ⁻³ for determinands other than benzene.	toluene	0.28	0.58	N/A
		ethyl-benzene	0.21	0.68	N/A
		m-xylene and p-xylene	0.04	1.35	N/A
		o-xylene	0.17	0.68	N/A

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B8. Cross interference with ozone	No MCERTS pass/fail performance criterion				
	Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{O}_3} < 5 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene	0.78	36.3	Yes
		ethyl-benzene	0.54	36.8	Yes
		m-xylene and p-xylene	0.53	73.5	Yes
		o-xylene	0.69	36.3	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test)	No MCERTS pass/fail performance criterion				
	Influence of the	toluene	0.91	50.31	Yes
	interference from relative humidity at the span concentration value	ethyl-benzene	0.72	58.90	Yes
	(between 70 % and 90 % of the certification range) of benzene, $b_{rh} < 4 \%$.	m-xylene and p-xylene	0.73	117.33	Yes
	See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	o-xylene	0.46	57.98	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B9. Cross interference with water (relative humidity test) (continued)	No MCERTS pass/fail performance criterion				
	Influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene	0.96	0.57	N/A
		ethyl-benzene	1.20	0.67	N/A
		m-xylene and p-xylene	1.15	1.33	N/A
		o-xylene	0.88	0.66	N/A

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds	No MCERTS pass/fail performance criterion				
	Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene, $b_{\text{Corg}} < 5 \%$. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene	3.68	53.42	Yes
		ethyl-benzene	2.52	62.40	Yes
		m-xylene and p-xylene	2.08	124.31	Yes
		o-xylene	2.49	62.37	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
B10. Cross interference with organic compounds (continued)	No MCERTS pass/fail performance criterion				
	Influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene. See Column 5 for corresponding concentration values in $\mu\text{g m}^{-3}$ for determinands other than benzene.	toluene	0.50	0.58	N/A
		ethyl-benzene	2.14	0.68	N/A
		m-xylene and p-xylene	2.27	1.36	N/A
		o-xylene	4.68	0.68	N/A

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C2. Long term drift	No MCERTS pass/fail performance criterion:	toluene	3.81	45.4	Yes
	Long term drift at $0.5 \mu\text{g m}^{-3}$, determined at the span concentration value (between 70 % and 90 % of the certification of benzene, $d_{14d} < \pm 10$ %). See Column 5 for corresponding concentration values employed in $\mu\text{g m}^{-3}$ for determinands other than benzene.	ethyl-benzene	3.95	53.0	Yes
		m-xylene and p-xylene	3.20	105.6	Yes
		o-xylene	3.42	53.0	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / days	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C3. Maintenance interval	No MCERTS pass/fail performance criterion Maintenance interval, determined over the course of the field trial period, > 14d. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	toluene	90	N/A	Yes
		ethyl-benzene	90	N/A	Yes
		m-xylene and p-xylene	90	N/A	Yes
		o-xylene	90	N/A	Yes

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / %	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C4. Availability	No MCERTS pass/fail performance criterion Availability, determined over the course of the field trial period, > 90 %. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	toluene	99.9	Ambient Air	Yes
		ethyl-benzene	96.0	Ambient Air	Yes
		m-xylene and p-xylene	99.8	Ambient Air	Yes
		o-xylene	97.7	Ambient Air	Yes

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance characteristic	Performance criterion	Determinand	Test result / $\mu\text{g m}^{-3}$	Column 5 / $\mu\text{g m}^{-3}$	Performance characteristic met
C5. Reproducibility standard deviation under field conditions	No MCERTS pass/fail performance criterion	toluene	0.19	Ambient Air	Yes
		ethyl-benzene	0.38	Ambient Air	No
		m-xylene and p-xylene	0.22	Ambient Air	Yes
	Reproducibility standard deviation, determined over the course of the field trial period (more than 90 days), $S_{Rf} > \pm 0.25 \mu\text{g m}^{-3}$. See Column 5 for concentration value employed in $\mu\text{g m}^{-3}$.	o-xylene	0.14	Ambient Air	Yes

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 5: Gases used in the laboratory tests

Cylinder No	Gas	Concentration / $\mu\text{mol mol}^{-1}$	Purpose
D18 7356 NPL Primary Reference Gas Mixture	ethane	2.61 ± 0.05	30 hydrocarbon species (ozone precursors) in nitrogen.
	ethene	2.59 ± 0.05	
	propane	2.58 ± 0.05	
	propene	2.56 ± 0.05	
	2-methylpropane	2.60 ± 0.05	Diluted to prepare required determinand concentrations.
	butane	2.52 ± 0.05	
	ethyne	2.59 ± 0.05	
	trans-but-2-ene	2.52 ± 0.05	
	but-1-ene	2.48 ± 0.05	
	cis-but-2-ene	2.49 ± 0.05	
	2-methylbutane	2.52 ± 0.05	
	pentane	2.56 ± 0.05	
	1,3-butadiene	2.56 ± 0.05	
	trans-pent-2-ene	2.43 ± 0.05	
	pent-1-ene	2.48 ± 0.05	
	2-methylpentane	2.52 ± 0.05	
	hexane	2.53 ± 0.05	
	isoprene	2.53 ± 0.05	
	heptane	2.49 ± 0.05	
	benzene	2.54 ± 0.05	
	2,2,4-trimethylpentane	2.54 ± 0.05	
	octane	2.52 ± 0.05	
	toluene	2.51 ± 0.05	
	ethyl benzene	2.55 ± 0.05	
	m-xylene	2.54 ± 0.05	

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

	p-xylene	2.54 ± 0.05	
	o-xylene	2.51 ± 0.05	
	1,3,5-trimethylbenzene	2.39 ± 0.05	
	1,2,4-trimethylbenzene	2.40 ± 0.05	
	1,2,3-trimethylbenzene	2.34± 0.05	

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Cylinder No	Gas	Concentration / nmol mol ⁻¹	Purpose
D41 9069 NPL Primary Reference Gas Mixture	ethane	204.9 ± 4.1	30 hydrocarbon species (ozone precursors) in nitrogen.
	ethene	203.8 ± 4.1	
	propane	202.9 ± 4.1	
	propene	201.1 ± 4.0	
	2-methylpropane	204.4 ± 4.1	Diluted to prepare required determinand concentrations.
	butane	198.5 ± 4.0	
	ethyne	203.7 ± 4.1	
	trans-but-2-ene	198.4 ± 4.0	
	but-1-ene	195.3 ± 3.9	
	cis-but-2-ene	195.7 ± 3.9	
	2-methylbutane	198.2 ± 4.0	
	pentane	201.1 ± 4.0	
	1,3-butadiene	201.0 ± 4.0	
	trans-pent-2-ene	191.5 ± 3.8	
	pent-1-ene	195.0 ± 3.9	
	2-methylpentane	198.4 ± 4.0	
	hexane	198.7 ± 4.0	
	isoprene	198.7 ± 4.0	
	heptane	196.2 ± 3.9	
	benzene	199.9 ± 4.0	
	2,2,4- trimethylpentane	199.9 ± 4.0	
	octane	198.0 ± 4.0	
	toluene	197.4 ± 3.9	
	ethyl benzene	200.1 ± 4.0	
	p-xylene	201.5 ± 4.0	
	m-xylene	197.2 ± 3.9	
	o-xylene	200.0 ± 4.0	

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

	1,3,5-trimethylbenzene	204.0 ± 4.1	
	1,2,4-trimethylbenzene	200.0 ± 4.0	
	1,2,3-trimethylbenzene	190.6 ± 3.8	

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Cylinder No	Gas	Concentration / nmol mol ⁻¹	Purpose
D64 1653 NPL Primary Reference Gas Mixture	ethane	208.66 ± 4.17	30 hydrocarbon species (ozone precursors) in nitrogen.
	ethene	207.51 ± 4.15	
	propane	206.58 ± 4.13	
	propene	204.78 ± 4.10	
	2-methylpropane	208.15 ± 4.16	Diluted to prepare required determinand concentrations.
	butane	202.06 ± 4.04	
	ethyne	207.44 ± 4.15	
	trans-but-2-ene	202.03 ± 4.04	
	but-1-ene	198.88 ± 3.98	
	cis-but-2-ene	199.22 ± 3.98	
	2-methylbutane	201.82 ± 4.04	
	pentane	204.74 ± 4.09	
	1,3-butadiene	204.67 ± 4.09	
	trans-pent-2-ene	194.96 ± 3.90	
	pent-1-ene	199.58 ± 3.97	
	2-methylpentane	202.00 ± 4.04	
	hexane	202.25 ± 4.05	
	isoprene	202.32 ± 4.05	
	heptane	199.68 ± 3.99	
	benzene	203.32 ± 4.07	
	2,2,4- trimethylpentane	203.53 ± 4.07	
	octane	201.57 ± 4.03	
	toluene	200.91 ± 4.02	
	ethyl benzene	203.87 ± 4.08	
	p-xylene	203.70 ± 4.07	
	m-xylene	203.10 ± 4.06	
	o-xylene	201.19 ± 4.02	

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

	1,3,5-trimethylbenzene	191.70 ± 3.83	
	1,2,4-trimethylbenzene	192.31 ± 3.85	
	1,2,3-trimethylbenzene	187.38 ± 3.75	

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Cylinder No	Gas	Concentration / nmol mol ⁻¹	Purpose
D61 2082 NPL Primary Reference Gas Mixture*	ethane	12.32 ± 0.25	30 hydrocarbon species (ozone precursors) in nitrogen.
	ethene	12.24 ± 0.24	
	propane	12.20 ± 0.24	
	propene	12.07 ± 0.24	
	2-methylpropane	12.27 ± 0.25	Diluted to prepare required determinand concentrations, Or employed without further dilution
	butane	11.91 ± 0.24	
	ethyne	12.23 ± 0.37	
	trans-but-2-ene	11.91 ± 0.24	
	but-1-ene	11.72 ± 0.23	
	cis-but-2-ene	11.74 ± 0.23	
	2-methylbutane	11.90 ± 0.24	
	pentane	12.07 ± 0.24	
	1,3-butadiene	12.06 ± 0.24	
	trans-pent-2-ene	11.49 ± 0.23	
	pent-1-ene	11.71 ± 0.23	
	2-methylpentane	11.91 ± 0.24	
	hexane	11.92 ± 0.24	
	isoprene	11.93 ± 0.24	
	heptane	11.77 ± 0.24	
	benzene	12.00 ± 0.24	
	2,2,4- trimethylpentane	12.00 ± 0.24	
	octane	11.88 ± 0.24	
	toluene	11.85 ± 0.24	
	ethyl benzene	12.01 ± 0.24	
	p-xylene	12.09 ± 0.24	
	m-xylene	11.84 ± 0.24	
	o-xylene	12.01 ± 0.24	

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

	1,3,5-trimethylbenzene	12.24 ± 0.37	
	1,2,4-trimethylbenzene	12.00 ± 0.36	
	1,2,3-trimethylbenzene	11.44 ± 0.34	

*Cylinder recertified but there was no change in determinand concentrations detected.

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Cylinder No	Gas	Concentration / $\mu\text{mol mol}^{-1}$	Molecular mass/ g mol^{-1}	Purpose
D64 1844 NPL Primary Reference Gas Mixture	2,4- dimethylpentane	198 ± 10	100.2	Multi- component hydrocarbons in nitrogen.
	2,2,3- trimethylbutane	203 ± 10	100.2	
	methylcyclopentane	190 ± 10	84.2	
	2-methylhexane	205 ± 10	100.2	Diluted to prepare required concentrations of cross interfering species.
	cyclohexane	208 ± 10	84.2	
	2,3- dimethylpentane	196 ± 10	100.2	
	carbon tetrachloride	194 ± 10	153.2	
	3-ethylpentane	204 ± 10	100.2	
	n-heptane	198 ± 10	100.2	
	trichloroethene	205 ± 10	131.4	

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Cylinder No	Gas	Concentration / $\mu\text{mol mol}^{-1}$	Purpose
25884	nitrogen BIP plus 99.99998 (Air Products)	Appropriate purity	Dilution gas (Installation and Commissioning Phase)
51213	nitrogen BIP plus 99.99998 (Air Products)	Appropriate purity	Dilution gas (Installation and Commissioning Phase)
310074	nitrogen BIP plus 99.99998 (Air Products)	Appropriate purity	Dilution gas (Laboratory Tests)
536942	nitrogen BIP plus 99.99998 (Air Products)	Appropriate purity	Dilution gas (Laboratory Tests)
259378	nitrogen BIP plus 99.99998 (Air Products)	Appropriate purity	Dilution gas (Laboratory Tests)
119948	nitrogen BIP plus 99.99998 (Air Products)	Appropriate purity	Dilution gas (Laboratory Tests)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

1.2 Notification proposal

1.2.1 Allocation according to measurement task

Two different types of Continuous Ambient Monitors (CAMs) (with 1 duplicate of each type of CAM), manufactured by Chromatotec, were required to be tested in accordance with “EN 14662-3: 2005- Ambient Air Quality –Standard method for the measurement of benzene concentrations-Part 3: Automated pumped sampling with in-situ gas chromatography” (hereby defined as **Reference 1**). This standard is fully compatible with the requirements of the Environment Agency for England and Wales’ Monitoring Certification Scheme called MCERTS. These requirements are summarised in “Performance Standards for Continuous Ambient Air Quality Monitoring Systems”, Environment Agency, Version 8, June 2012 (hereby defined as **Reference 2**).

All of the four instruments were to be tested simultaneously, in accordance with the schedule described in “Proposed Test Programme for MCERTS Certification of CAMs (Revised V3)”, which is dated 21/04/2009. This document is based on the requirements of References 1 and 2, and has approval from the Certification Committee convened by Sira Environmental Limited. The Test Programme is documented here in Appendix A.

1.2.2 Specific CAM identity

The CAMs systems were all supplied by Chromatotec and consisted of the following:

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

1.2.3 Additional measurement components

Additional components were supplied with the basic analysers to provide fuel and /or carrier gas and included the following:

AirmoPURE 45 PSI zero air generator (serial number 685079) for the FID instruments,

hydrogen (H₂) cylinder (Air Liquide, alpha standard, cylinder number 754570),

nitrogen (N₂) cylinder (Air Liquide, alpha standard, cylinder number, 647627).

A personal computer (IEI Technologies, Model EBC-2100-R21, serial number WA07502248) with monitor (Videoseven, Model R1711, serial number 193S71716S610e71384476) to enable control of all four CAMs externally from a temperature controlled environmental chamber.

Reference: E09040018

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Chromatotec supplied a hard copy of the manual for the CAMs and also provided on the job training in the use of the instrumentation.

A hydrogen generator was also supplied for the field trial to replace the hydrogen cylinder.

1.2.4 Device manufacturer and full address

The CAMs were manufactured by:

airmotec/Chromatotec
15 rue d'Artiguelongue
33240 Saint Antoine
France

Telephone: +33 (0)5 57 94 04 75
Fax: +33 (0)5 57 94 06 20
e-mail : michel.robert@chromatotec.com
Website: www.chromatotec.com

1.2.5 Field of application

Both types of CAMs are cyclic automated analysers, which sample a known volume of air through a sorbent medium for a fixed period of time, and then analyse the amount of the target determinands trapped using an automated gas chromatograph. One type of CAM (Chromatotec GC 866 FID airmoVOC, Model A21022) employs a flame ionisation detector (FID) to measure the determinands while the second type of CAM (Chromatotec GC 866 PID airTOXIC, Model A73022) uses a photo ionisation detector (PID).

1.2.6 List of determinands and certification ranges

All four CAMs measured simultaneously from the same sample gas line. The required determinands were generated from 30 component EU Directive ozone precursor mixtures diluted in nitrogen, which are produced by NPL. The parent mixtures were diluted as required in zero nitrogen or scrubbed air. The starting concentration of the determinands in the parent mixtures (before dilution), expressed in units of parts per billion, was nominally the same for all the 30 compounds. The composition of each of the parent mixtures, together with the mixture containing cross-interfering species, is given in Table 5.

The standards (References 1 and 2) are specifically applicable to measurements of airborne benzene vapour in the $0 \mu\text{g m}^{-3}$ to $50 \mu\text{g m}^{-3}$ concentration range (standardised to 101.3 kPa and 293 K) but they can also be applied to other volatile organic compounds (VOCs) with the agreement of the Certification Committee (Reference 2).

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The additional VOCs required by Chromatotec to be tested were accommodated by carrying out the same testing procedures defined for benzene, as detailed in “Proposed Test Programme for MCERTS Certification of CAMs (Revised V3)”, and Reference 1 and 2.

Similar performance characteristics and performance criteria were then applied to the additional species. For example, the certification range for the type approval tests was $0 \mu\text{g m}^{-3}$ to $50 \mu\text{g m}^{-3}$ (standardised to 101.3 kPa and 293 K) for benzene, or 0 parts per billion (ppb) to 15.4 ppb where 1 ppb is equivalent to 1 nmol mol^{-1} . The certification range of the other determinands in the test programme was also 15.4 ppb. However, expressing the concentrations in units of $\mu\text{g m}^{-3}$ means that these additional VOCs each had different concentration values to that of benzene. Table 6 gives a summary of the full list of determinands tested and the certification ranges agreed with the Certification Body.

The performance criteria detailed in References 1 and 2 were generally required to be expressed as a percentage of the maximum input (or span) concentration of benzene, nominally $45 \mu\text{g m}^{-3}$ or 13.9 ppb. In all cases the span concentration could be within 70 % and 90 % of the agreed certification range. The span concentration for the additional compounds was also taken to be nominally 13.9 ppb, but again was a different value for each of the VOCs when expressed in units of $\mu\text{g m}^{-3}$. Table 7 gives a summary of the nominal span concentrations, limit value concentrations (as agreed with the Certification Body), 1/10 of the limit value concentrations for all the target determinands, expressed in units of ppb and $\mu\text{g m}^{-3}$.

The Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) and Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) were tested in the laboratory with the following determinands:

benzene; 2,2,4-trimethyl pentane (i-octane); n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Additionally, Chromatotec requested that **n-hexane** should also be considered as a further determinand for this type of CAM. The determinands m-xylene and p-xylene were analysed as one chromatographic peak and the results were reported as **the mean of the two**.

The Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) and Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) were also tested in the laboratory with the following determinands:

benzene; toluene; ethyl benzene; m-xylene; p-xylene; o-xylene. Again, the determinands m-xylene and p-xylene were analysed as one chromatographic peak and the results were reported as the mean of the two.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 6: List of determinands and certification ranges, as agreed by the certification body

<u>Determinand</u>	Certification Range / ppb	Certification Range / $\mu\text{g m}^{-3}$
benzene	0-15.4	0-50.0
2,2,4-trimethyl pentane	0-15.4	0-73.1
n-heptane	0-15.4	0-64.2
toluene	0-15.4	0-59.0
n-octane	0-15.4	0-73.1
ethyl-benzene	0-15.4	0-68.0
m-xylene	0-15.4	0-68.0
p-xylene	0-15.4	0-68.0
o-xylene	0-15.4	0-68.0
1,3,5- trimethylbenzene	0-15.4	0-77.0
1,2,4- trimethylbenzene	0-15.4	0-77.0
1,2,3- trimethylbenzene	0-15.4	0-77.0
n-hexane	0-15.4	0-55.2

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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 7: List of determinands and key nominal concentrations agreed by the certification body, expressed in appropriate units

Column	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B
Determinand	Span conc / ppb	Span conc / $\mu\text{g m}^{-3}$	Limit conc / ppb	Limit conc / $\mu\text{g m}^{-3}$	1/10 Limit conc / ppb	1/10 Limit Conc / $\mu\text{g m}^{-3}$	Conc 1 / ppb	Conc 1 / $\mu\text{g m}^{-3}$	Conc 2 / ppb	Conc 2 / $\mu\text{g m}^{-3}$	Conc 3 / ppb	Conc 3 / $\mu\text{g m}^{-3}$
benzene	13.9	45.0	1.54	5.0	0.15	0.50	0.31	1.0	0.09	0.30	0.05	0.15
2,2,4-trimethyl-pentane (i-octane)	13.9	65.8	1.54	7.31	0.15	0.73	0.31	1.47	0.09	0.39	0.05	0.22
n-heptane	13.9	57.7	1.54	6.42	0.15	0.64	0.31	1.29	0.09	0.45	0.05	0.19
toluene	13.9	53.1	1.54	5.90	0.15	0.59	0.31	1.19	0.09	0.35	0.05	0.18
n-octane	13.9	65.8	1.54	7.31	0.15	0.73	0.31	1.47	0.09	0.45	0.05	0.22
ethyl-benzene	13.9	61.2	1.54	6.80	0.15	0.68	0.31	1.37	0.09	0.41	0.05	0.20
m-xylene	13.9	61.2	1.54	6.80	0.15	0.68	0.31	1.37	0.09	0.41	0.05	0.20
p-xylene	13.9	61.2	1.54	6.80	0.15	0.68	0.31	1.37	0.09	0.41	0.05	0.20
o-xylene	13.9	61.2	1.54	6.80	0.15	0.68	0.31	1.37	0.09	0.41	0.05	0.20
1,3,5-trimethyl-benzene	13.9	69.2	1.54	7.70	0.15	0.77	0.31	1.55	0.09	0.46	0.05	0.15
1,2,4-trimethyl-benzene	13.9	69.2	1.54	7.70	0.15	0.77	0.31	1.55	0.09	0.46	0.05	0.23
1,2,3-trimethyl-benzene	13.9	69.2	1.54	7.70	0.15	0.77	0.31	1.55	0.09	0.46	0.05	0.23
n-hexane	13.9	49.6	1.54	5.52	0.15	0.55	0.31	1.11	0.09	0.33	0.05	0.17

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Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

1.2.7 Restrictions

None.

1.2.8 Notes

None.

1.2.9 Scientists involved in the testing of the CAMs

- N A Martin
- S D Jarvis
- S White
- J J Helmore
- O J Bevan

1.2.10 Test Report number and completion date

Report number: E09040018

Completion date: 14th June 2013

2. Task definition

2.1 Type of test

This is the first time that both types of CAMs were tested under the Environment Agency for England and Wales' Monitoring Certification Scheme called MCERTS.

2.2 Objective

The performance characteristics of the four CAMs tested were compared against the performance criteria defined in "EN 14662-3: 2005- Ambient Air Quality –Standard method for the measurement of benzene concentrations-Part 3: Automated pumped sampling with in-situ gas chromatography" and "Performance Standards for Continuous Ambient Air Quality Monitoring Systems", Environment Agency, Version 8, June 2012.

3. Description of the measuring system tested

3.1 Introduction

The Chromatotec GC 866 FID airmoVOC (Model A21022) (and its duplicate) was a high performance gas chromatograph with flame ionisation detection and an on-line sample preparation. It was designed to measure volatile organic compounds (benzene, toluene and xylenes included) in gaseous samples at ambient and emission level concentration ranges. The CAM was tested using bottled hydrogen (Air Liquide, alpha standard) and a zero air generator (Compressor, airmoPURE 45 psi) but could also be operated with gases from a hydrogen generator and bottled zero air.

The Chromatotec GC 866 PID airToxic (Model A73022) (and its duplicate) was a high performance gas chromatograph with photo ionisation detection and an on-line sample

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

preparation. It was designed to measure "BTX" organic compounds (benzene, toluene, ethylbenzene, m- and p-xylene, and o-xylene in gaseous samples at ambient and emission level concentration ranges. The CAM was tested using bottled nitrogen (Air Liquide, alpha standard).

A personal computer (IEI Technologies, Model EBC-2100-R21), and monitor (Videoseven, Model R1711, serial number 193S71716S610e71384476) were employed to remotely control all four CAMs.

Brief information supplied by the manufacturer for each type of CAM is included in Sections 3.2 and 3.3.

A copy of the manuals for the CAMs is also provided in Appendix B.

3.2 Chromatotec GC 866 FID airmoVOC (Model A21022)

3.2.1 Main Components

The principal components for the Chromatotec GC 866 FID airmoVOC (Model A21022) family of CAMs are:

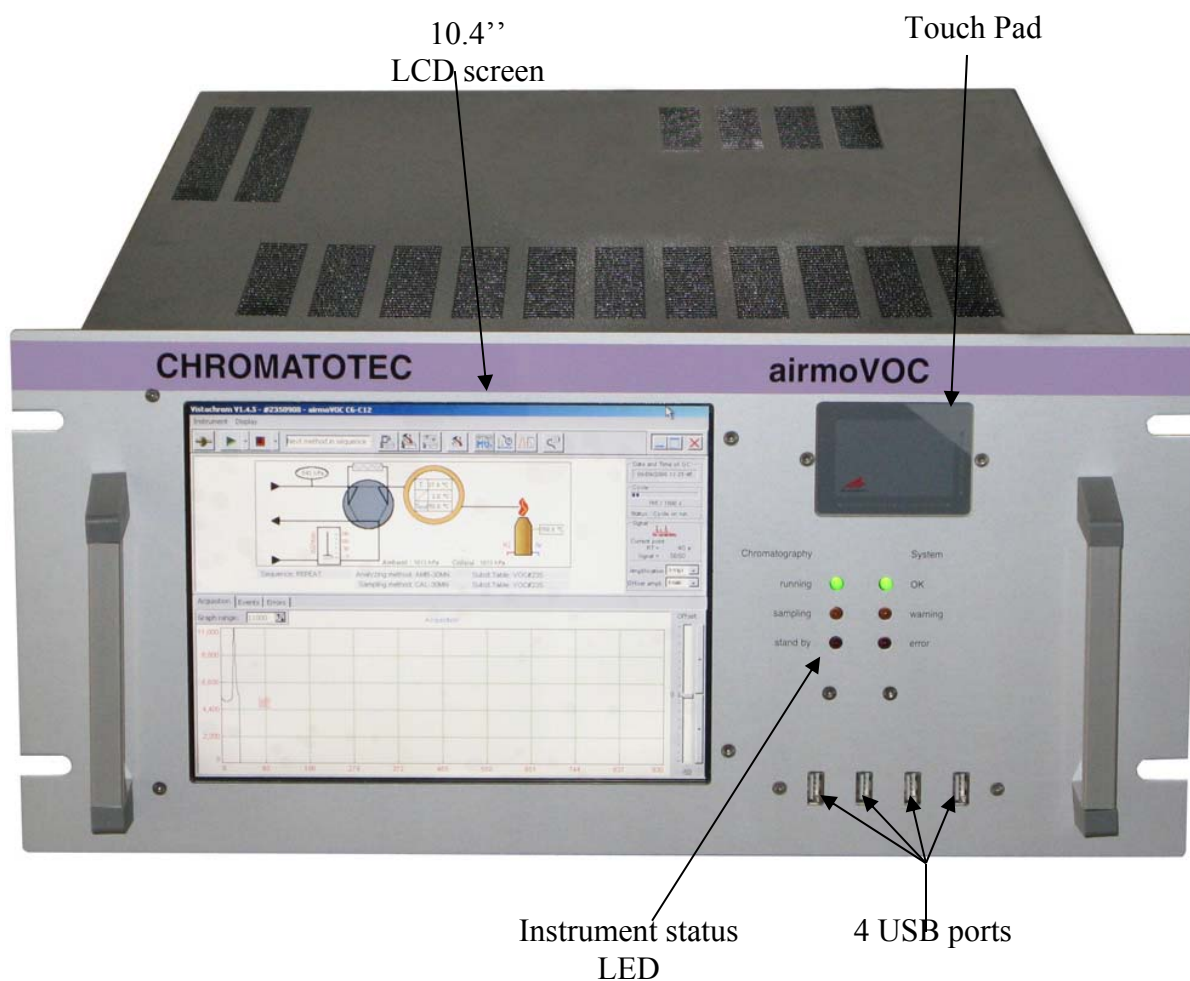
Pneumatic valve: 6 ports 1/8"
 Analytical column: capillary metallic column
 Detector: Flame ionisation detector (FID)
 Carrier gas: Hydrogen
 Critical orifice: 50, 76 or 100 μ m
 Trap: 1 phase
 VistaCHROM software
 Size: 5 U
 Weight: 25kg (packed: 45kg)

An integrated CPU card enables communication with a PC with the chromatography software allowing for complete automation of the system, signal acquisition, and data processing. The data is displayed by the Peak Viewer software allowing for chromatography peak identification using a reference substance table, data saving on the hard disk, and trend creation allowing a display of the evolution of selected peak retention times and surface (or concentration of the corresponding compounds).

Figures 1 and 2 respectively show the instrument from the front and rear face.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Front face:



Size 5U:
 Length: 48.0 cm
 Height: 22.0 cm
 Depth: 73.0 cm

Figure 1: Photograph of front of Chromatotec GC 866 FID airmoVOC (Model A21022)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Rear face:

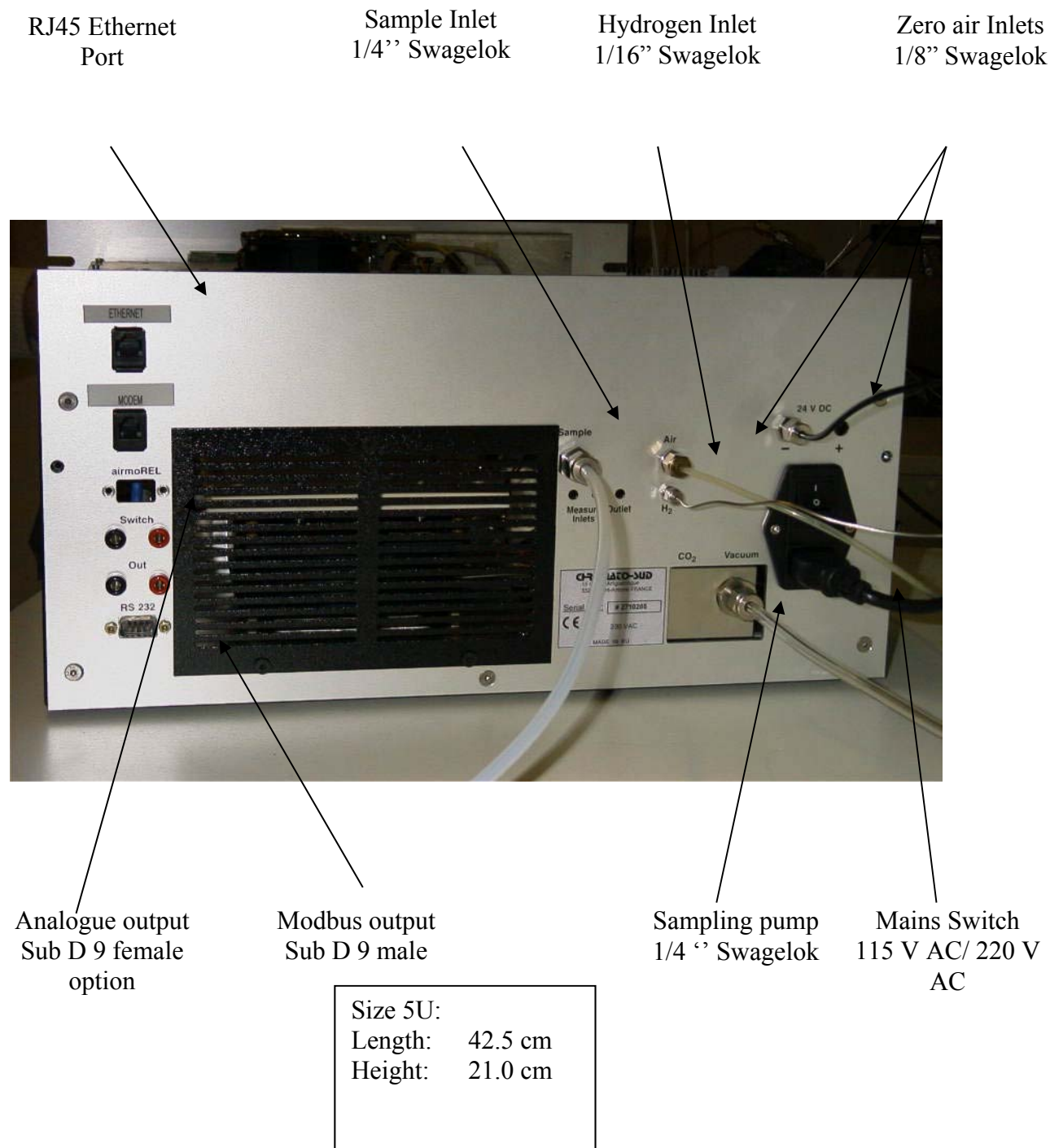


Figure 2: Photograph of back of Chromatotec GC 866 FID airmoVOC (Model A21022)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

3.2.2 Chromatograph operating principle

The complete cycle of gas analysis is carried out in two successive steps.

The first stage is the **sampling** step which pre-concentrates VOCs contained in the ambient air or alternatively in a gas calibration standard. Figure 3 shows a schematic diagram of this step.

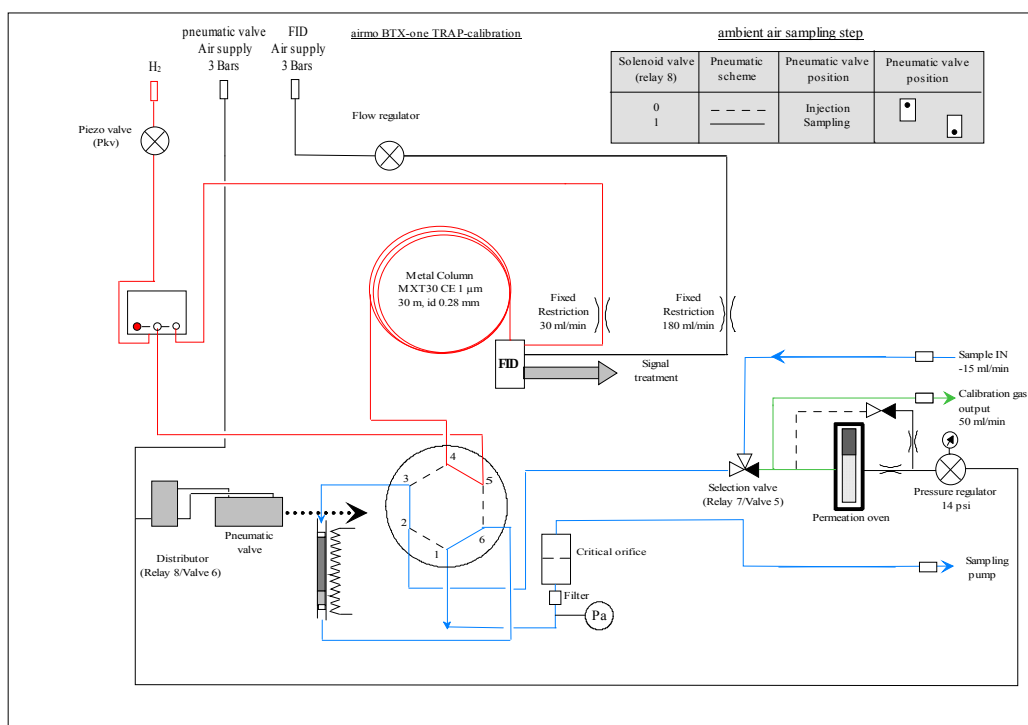


Figure 3 Schematic diagram of sampling step

The sample is introduced into the CAM through the sample inlet located at the rear (employing an external pump) and is collected onto an adsorption trap. The trap is a fine tube containing porous substances, which extracts the gas components according to their affinity for these phases. The trap phase is chosen so as to adsorb heavy VOCs while permanent gases and water vapour are not retained.

It is also possible, if required, to add to the sample gas flow an exactly known amount of reference standard compounds.

The sample flow rate is fixed in the instrument by the size of the critical orifice, and the additional measurement of the pressure and the sampling time allows the volume of sampled gas (ambient air or standard gas) to be determined. At the end of the sampling period a relay is activated to direct the sample flow into the instrument's vent.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The second stage of the cycle is the analysis step where the pneumatic valve changes from its “sampling” position to the “injection” position, and then after thermal desorption of the trap, the VOCs are injected into the chromatographic column by the carrier gas. Figure 4 shows a schematic diagram of this step.

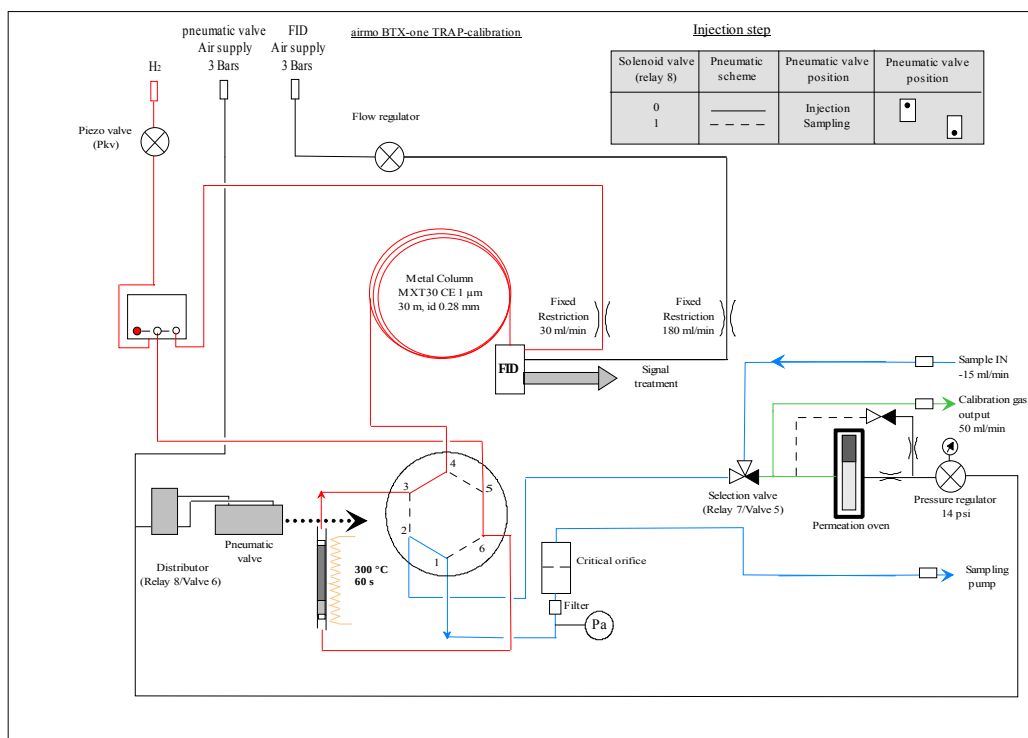


Figure 4 Schematic diagram of injection step

The analytical column is located in a programmable temperature controlled oven whose temperature gradient is initiated at the same time as the trap thermal desorption step is activated.

The sample components elute in the column at a characteristic rate (depending on their boiling points and their interactions with the column stationary phase). Generally, the retention time of the compounds increases with their molecular mass (boiling point). Individual sample components are separated and then detected by the FID, which is located at the extremity of the column outlet and is where the sample is burned in a flame fed by a mixture of hydrogen and air.

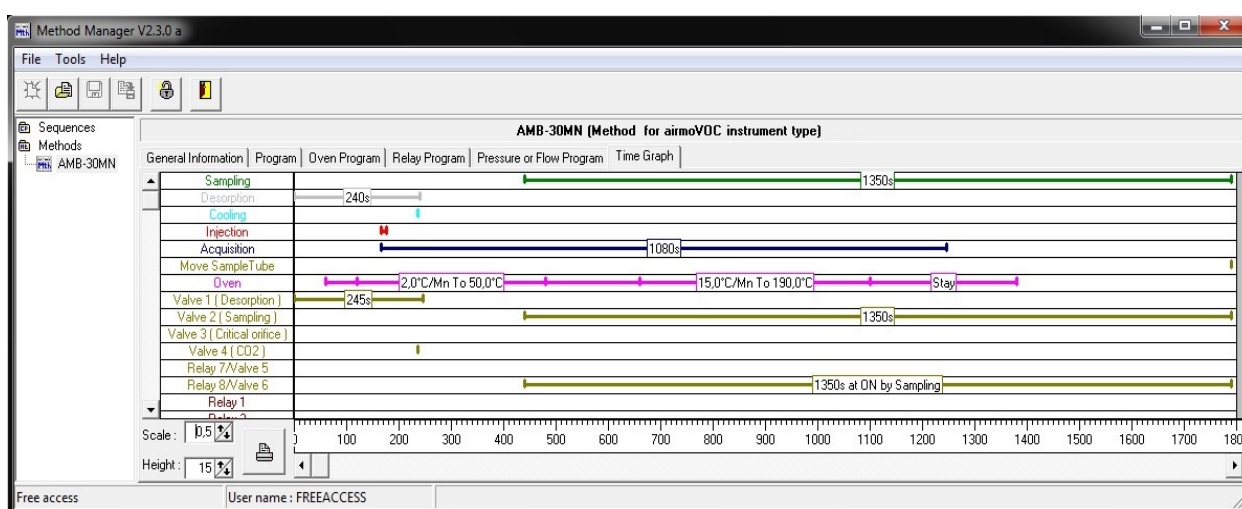
The combustion of organic compounds in a flame produces ions, which are collected by an electrode, and the resulting current is amplified by an electrometer and converted to a direct current voltage, which is proportional to sample concentration for a given compound.

This electrical signal is digitised and transferred to the CPU card where the microprocessor processes the data (integration, mass or concentration calculation, peak identification). All parameters (data results, chromatograms, integration reports) are then transferred via a RS-232

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

output where they can be displayed and retrieved by the software. The digitised signal is also available as an analogue output (0-1V).

Figure 5 gives a pictorial representation of the sample analysis time cycle including details of the oven temperature programme, and valve activation process.



Time graph airmoVOC for 30 minute cycle

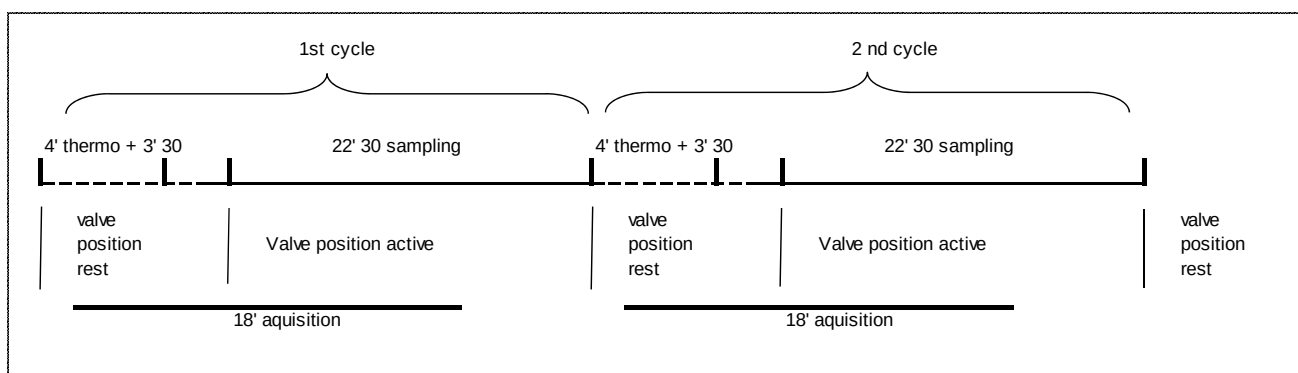


Figure 6 Schematic diagram of the sample analysis time cycle

An external or internal calibration system is used to monitor the stability of the analyser and validate the measurements. The calibration is carried out with a benzene permeation tube but for validating the stability of heavy compounds an o-xylene permeation tube is also added. The Chromatotec GC 866 FID airmoVOC (Model A21022) versions tested here all employed the internal calibration system option with both benzene and o-xylene permeation tubes.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

3.3 Chromatotec GC 866 PID airToxic (Model A73022)

3.3.1 Main Components

The principal components of the Chromatotec GC 866 PID airToxic (Model A73022) family of CAMs are:

Pneumatic valve: 6 ports 1/8" (A 6UWP)
Replacement rotor: SSA-6-UWP
Analytical column: capillary metallic column
Detector: Photo ionisation detector (PID)
Carrier gas: Nitrogen (quality 5.5 minimum)
Lamp cleaning: zero air or nitrogen
Trap: 1 phase
Critical orifice: 50 μ m
Supply voltage: 115VAC or 220 VAC
Vistachrom software
Dimension: 19", 5U
Weight: 25 kg (packed: 45 kg)

An integrated CPU card enables communication with a PC with the chromatography software allowing for complete automation of the system, signal acquisition, and data processing. The data is displayed by the Peak Viewer software allowing for chromatography peak identification using a reference substance table, data saving on the hard disk, and trend creation allowing a display of the evolution of selected peak retention times and surface (or concentration of the corresponding compounds).

Figures 7 and 8 respectively show the instrument from the front and rear face.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Front face:

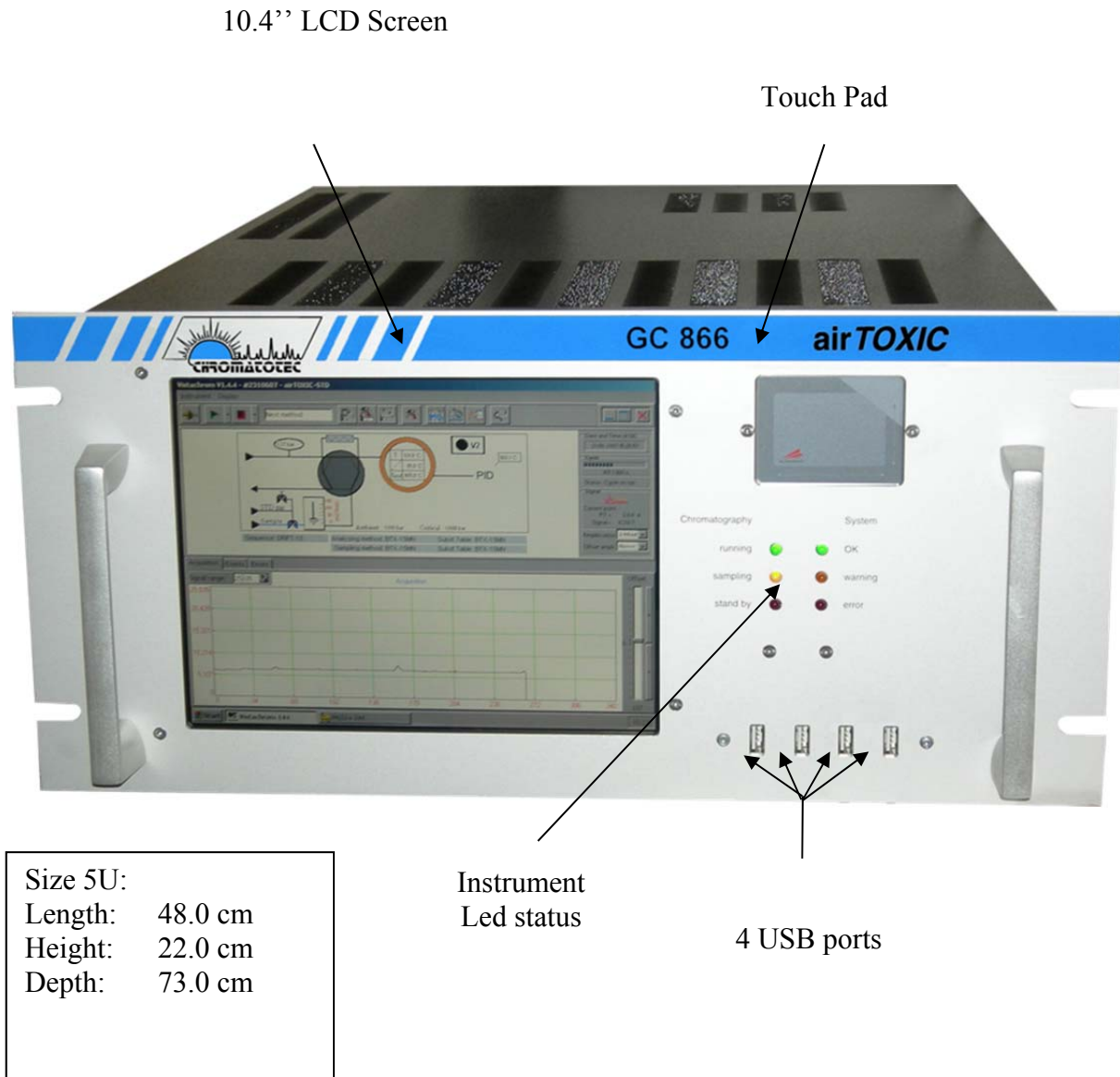


Figure 7: Photograph of front of Chromatotec GC 866 PID airToxic (Model A73022)

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Rear face:

Ethernet port
RJ45

Modem port
RJ11

Sample Inlet
1/4" Swagelok

N₂ Inlet
1/8" Swagelok

Air Inlet
1/8" Swagelok

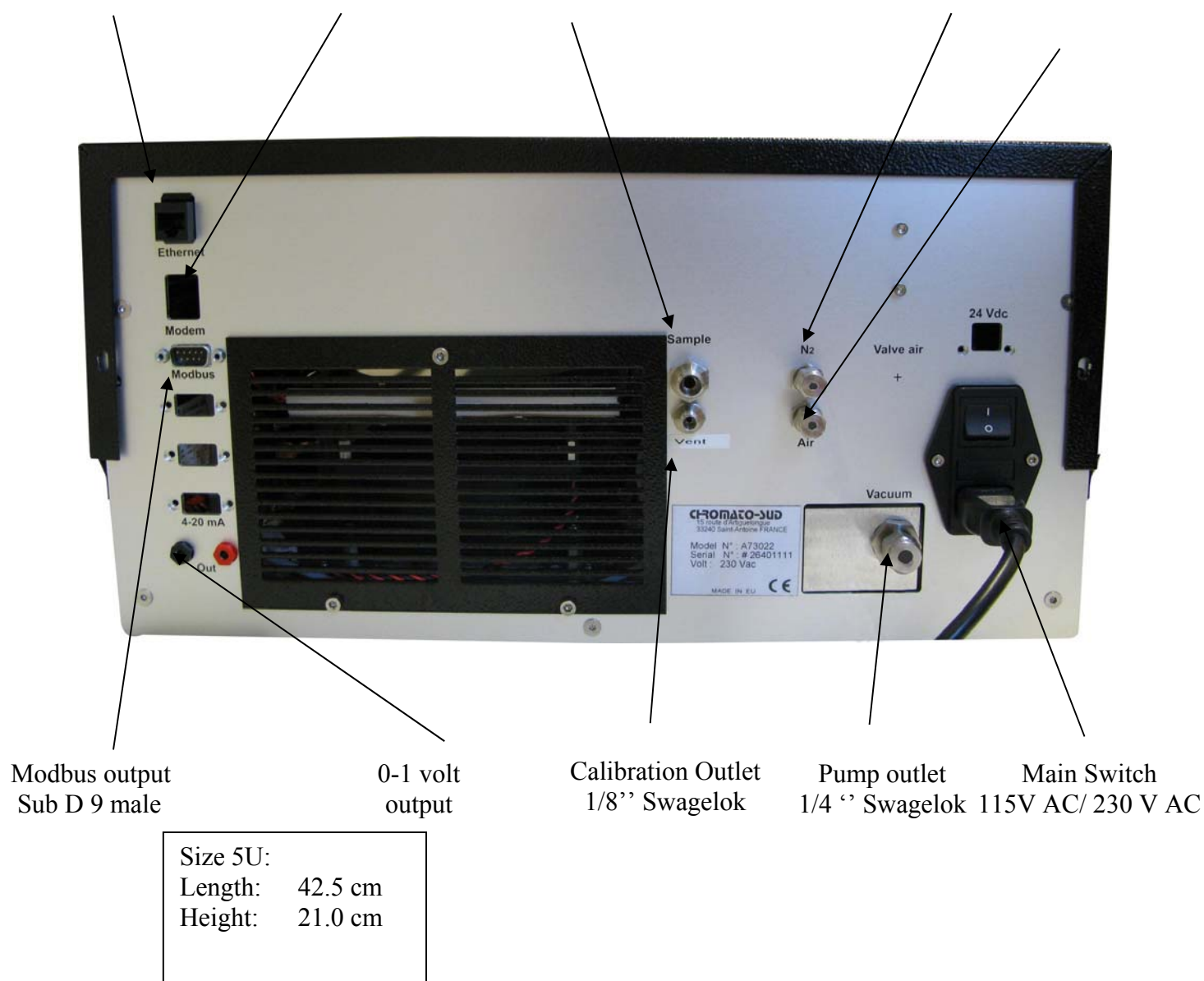


Figure 8: Photograph of back of Chromatotec GC 866 PID airToxic (Model A73022)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

3.3.2 Chromatograph operating principle

The complete cycle of gas analysis is carried out in two successive steps.

The first stage is the **sampling** step which pre-concentrates VOCs contained in the ambient air or alternatively in a gas calibration standard. Figure 9 shows a schematic diagram of this step.

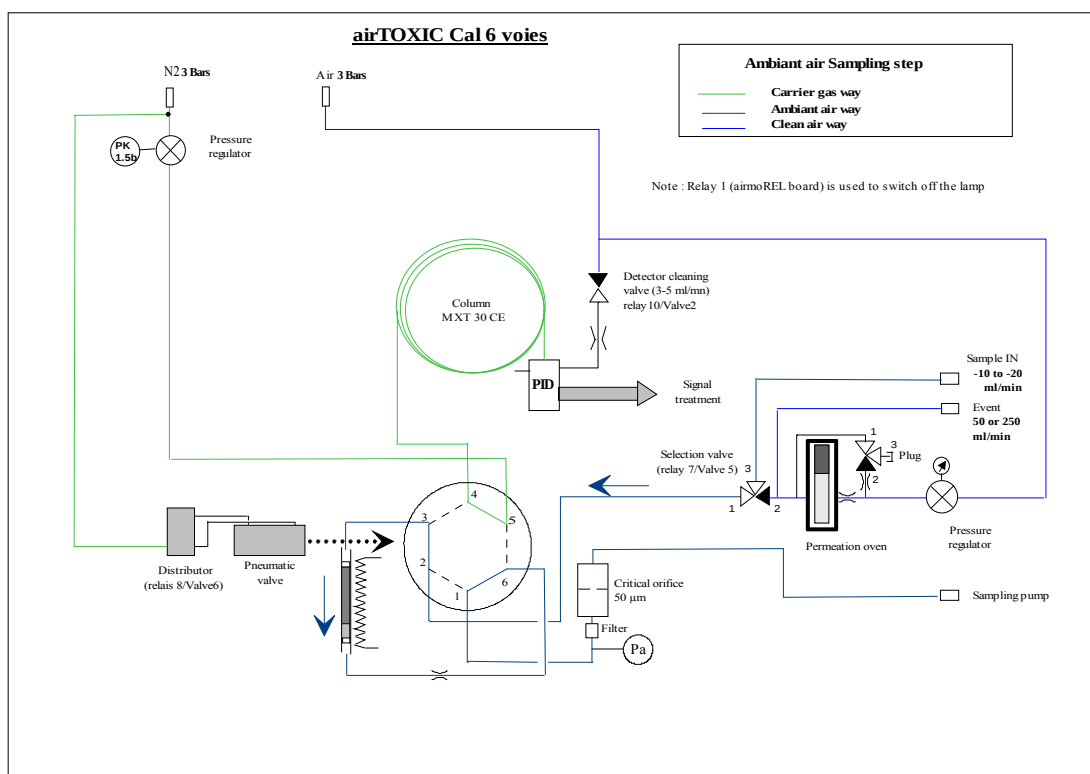


Figure 9 Schematic diagram of sampling step

The sample is introduced into the CAM through the sample inlet located at the rear (employing an external pump) and is collected onto an adsorption trap. The trap is fine tube containing porous substances, which extracts the gas components according to their affinity for these phases. The trap phase is chosen so as to adsorb heavy VOCs ($C_6 - C_{10}$ compounds) while permanent gases and water vapour are not retained.

It is also possible, if required, to add to the sample gas flow an exactly known amount of reference standard compounds.

The sample flow rate is fixed in the instrument by the size of the critical orifice, and the additional measurement of the pressure and the sampling time allows the volume of sampled gas

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

(ambient air or standard gas) to be determined. At the end of the sampling period a relay is activated to direct the sample flow into the instrument's vent.

The second stage of the cycle is the analysis step where the pneumatic valve changes from its "sampling" position to the "injection" position, and then after thermal desorption of the trap, the VOCs are injected into the chromatographic column by the carrier gas. Figure XX shows a schematic diagram of this step.

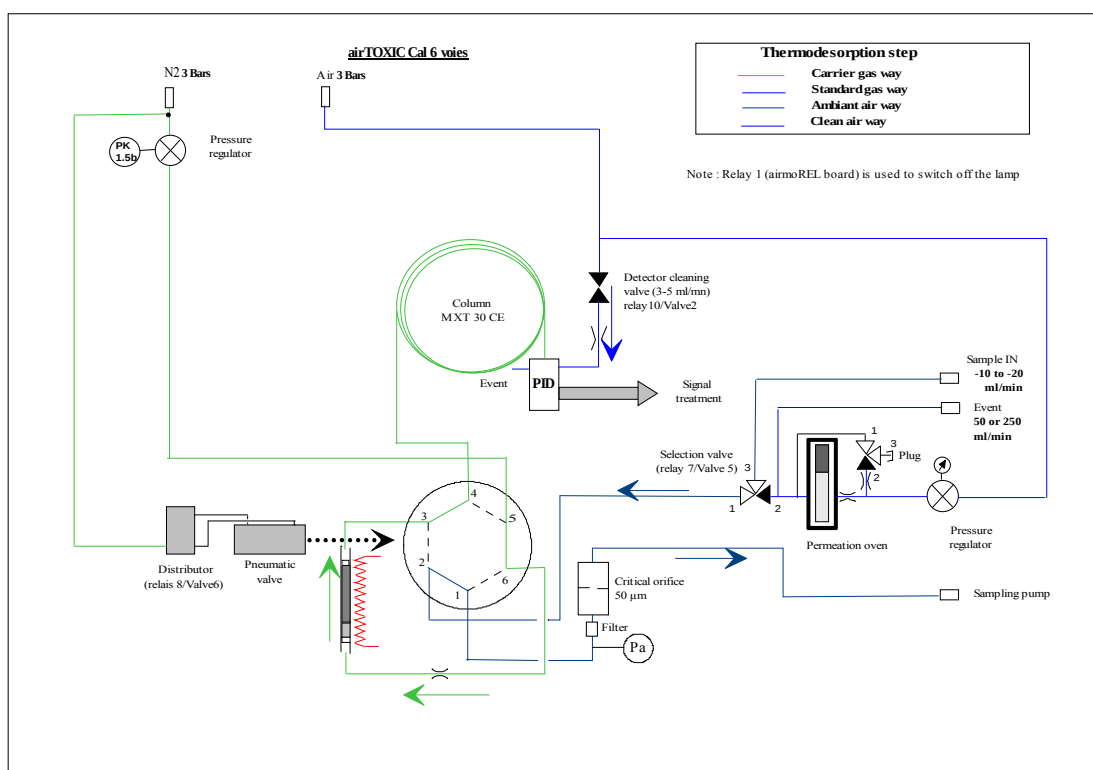


Figure 10 Schematic diagram of injection step

The analytical column is located in a programmable temperature controlled oven whose temperature gradient is initiated at the same time as the trap thermal desorption step is activated.

The sample components elute in the column at a characteristic rate (depending on their boiling points and their interactions with the column stationary phase). Generally, the retention time of the compounds increases with their molecular mass (boiling point). Individual sample components are separated and then detected by the photoionisation detector (PID), which is located at the extremity of the column outlet.

The PID operation is based on ionisation of compounds by means of UV-radiation employing Kr, Xe, or H₂ glow discharge lamps as the source of radiation. The lamp emits the photons with defined energies which pass through an ionisation chamber where certain photons are absorbed

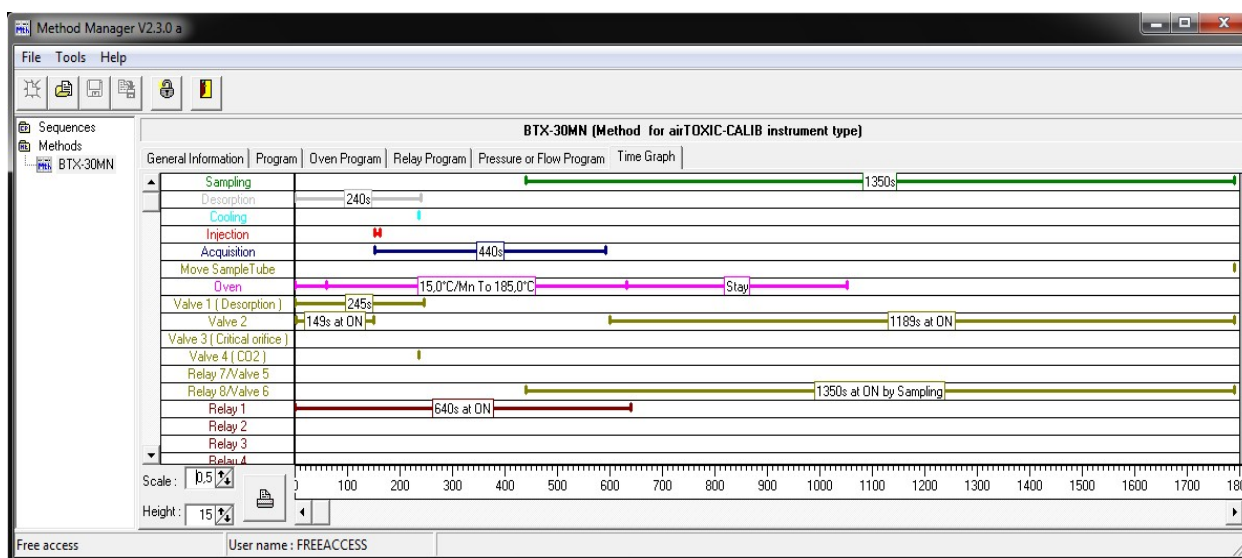
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

by the eluted species. The compounds with ionisation energies less than the incident photon energy are ionised.

The generated ion current, which is proportional to the sample concentration for a given compound, is then digitised and the signal transferred to the CPU card where the microprocessor processes the data (integration, mass or concentration calculation, peak identification). All parameters (data results, chromatograms, integration reports) are then transferred via a RS-232 output where they can be displayed and retrieved by the software. The digitised signal is also available as an analogue output (0-1V).

Unlike the FID, where the sample is removed by burning, the PID is not a destructive detector and the substances emerging from the analytical column are directly in contact with the lamp area. Thus, to avoid any VOC accumulation on the lamp, which reduces the sensitivity of the detector, a solenoid valve activates a stream of zero air/N₂ to clean the lamp area.

Figure 11 gives a pictorial representation of the sample analysis time cycle including details of the oven temperature programme, and valve activation process.



Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Time graph airToxic 30 minute cycle

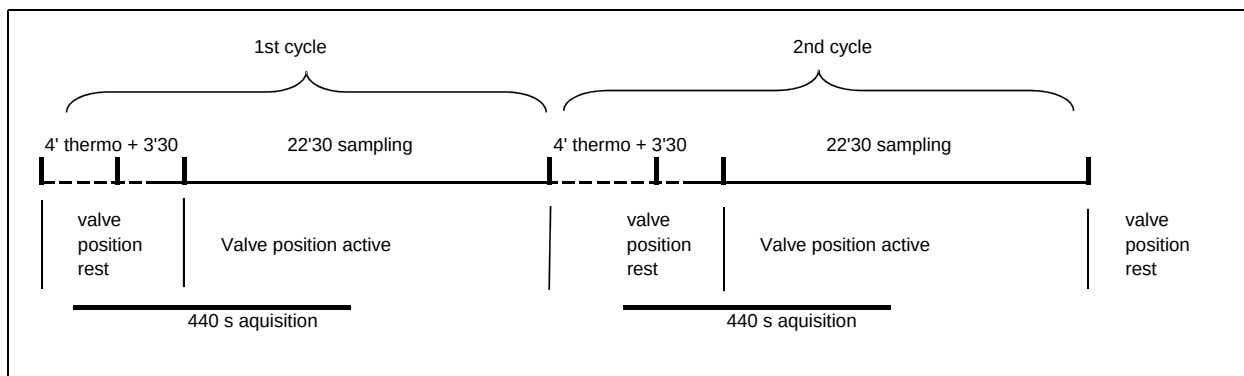


Figure 12 Schematic diagram of the sample analysis time cycle

An external or internal calibration system is used to monitor the stability of the analyser and validate the measurements. The calibration is carried out with a benzene permeation tube. The Chromatotec GC 866 PID airToxic (Model A73022) versions tested here all employed the internal calibration system option.

4. Test Programmes

4.1 Laboratory test programme

The Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), and Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) were subjected to the relevant tests assigned to the National Physical Laboratory (NPL) in “Proposed Test Programme for MCERTS Certification of CAMs (Revised V3)”, dated 21/04/2009.

The Laboratory Test Programme was proposed by NPL in consultation with **airmotec/Chromatotec** and was accepted by Sira Environmental Limited. The document took into account the procedures defined in References 1 and 2, and is included in Appendix A. The test results obtained for each CAM were compared to the performance characteristics and performance criteria given in References 1 and 2.

The laboratory and field tests were conducted in accordance UKAS-accredited NPL Test Procedures QPAS/B/528a and QPAS/B/528b, using equipment that was appropriately calibrated.

The CAMs under test were mostly housed in a temperature controlled environmental chamber (nominal temperature range, -20 °C to +70 °C), which was maintained at nominally 20 °C for the majority of the laboratory tests. Important environmental data, including temperature was also logged. The source gases used for the tests were located outside the environmental chamber and, where possible, housed in a ventilated Gas Cylinder Cabinet.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The target determinand species and any hydrocarbon cross-interfering compounds were generated using a specialised gas blending system. This consisted of one or more calibrated “Restrictor valves” or mass flow controllers, which were used to control the flow rate of the parent gas mixtures. In addition, calibrated mass flow controllers were employed for diluting the parent mixtures with nitrogen BIP plus 99.99998%.

The “Restrictor valve” was developed at NPL to handle low concentration multi-component volatile organic compound mixtures with minimal adsorption losses. All tubing upstream of the dilution point was made of Silco steel. All tubing connected to the test gas manifold was made of perfluoroalcoxy- (PFA), and the manifold was fabricated, in-house, from polytetrafluoroethylene (PTFE). This was used to distribute the determinand mixtures to the CAMs before being safely exhausted. A separate excess flow was also fitted to the gas manifold for cases where high rates were employed to prevent any undesirable build-up of pressure.

The concentration, C_n , delivered of each determinand was calculated from:

$$C_n = \frac{C_o \cdot F_v}{(F_v + F_D)}$$

where C_o is the appropriate certified concentration of each VOC in the parent mixture, F_v is the measured flow rate of determinand in the parent mixture, and is F_D the flow rate of the diluent gas.

The flow rates were initially set using a Chrompack FP-meter (Model FP 407 (serial number 2100524) and then calibrated using a DryCal flow meter (Base unit: ML-800 (serial number 118123) with ML-800-10 (serial number 116208) and ML-800-44 (serial number 116925).

For the cross interference tests with ozone a separate ozone generator and calibrated ozone photometer were employed. For the cross inference tests with water vapour the CAMs employed a controlled atmosphere test facility (CATFAC) together with a calibrated water vapour generator, hygrometer, pressure sensor and NPL’s barograph.

Evidence of the laboratory tests in operation is given below. Figure 13 shows the sample manifold made out of polytetrafluoroethylene, which was employed to distribute the gases to the four CAMs. Figure 14 shows the flow rate calibration system and one of the “Restrictor” valves employed to introduce the determinands NPL Standard Gas Mixtures into the sample manifold. Figure 15 shows a close-up of a “Restrictor” valve coupled to a Standard Gas Mixture. Figure 16 shows all four CAMs in operation, located inside NPL’s environmental chamber where the majority of laboratory tests were carried out. Figure 17 shows all four CAMs in operation, located by NPL’s CATFAC, where the cross interference test with water vapour was carried out. This photograph also shows the nitrogen and hydrogen cylinders employed by the manufacturer. Figure 18 shows the zero air generator (Compressor, airmoPURE 45 psi) located outside NPL’s environmental chamber, together with determinand gas mixtures being piped to the test manifold.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

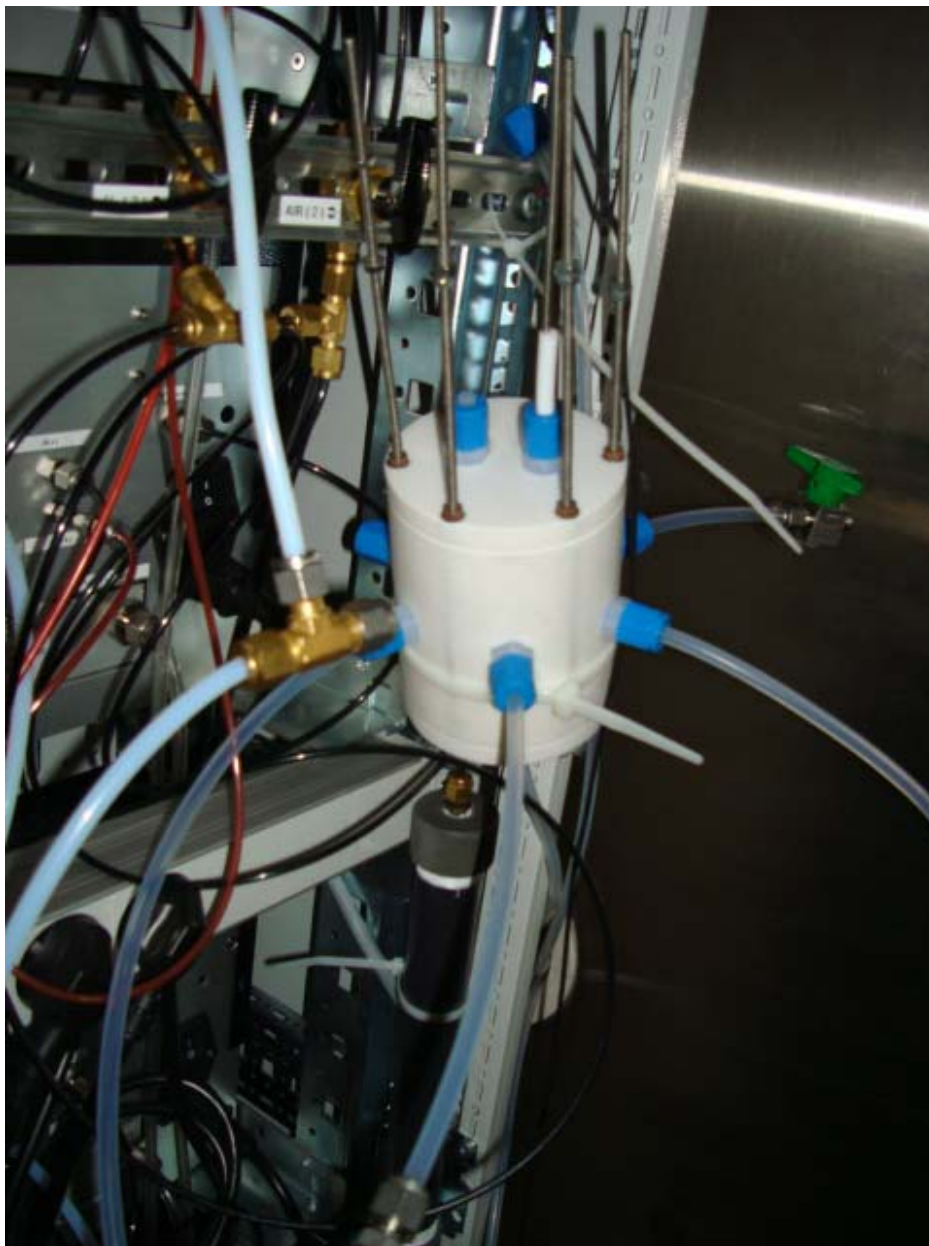


Figure 13: Photograph showing the sample manifold employed to distribute the gases to the four CAMs.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 14: Photograph showing the flow rate calibration system and one of the “Restrictor” valves employed to introduce the determinands from the NPL Standard Gas Mixtures into the sample manifold.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 15: Photograph showing a close-up of a “Restrictor” valve coupled to a Standard Gas Mixture.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 16: Photograph showing all four CAMs in operation, located in NPL's environmental chamber.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

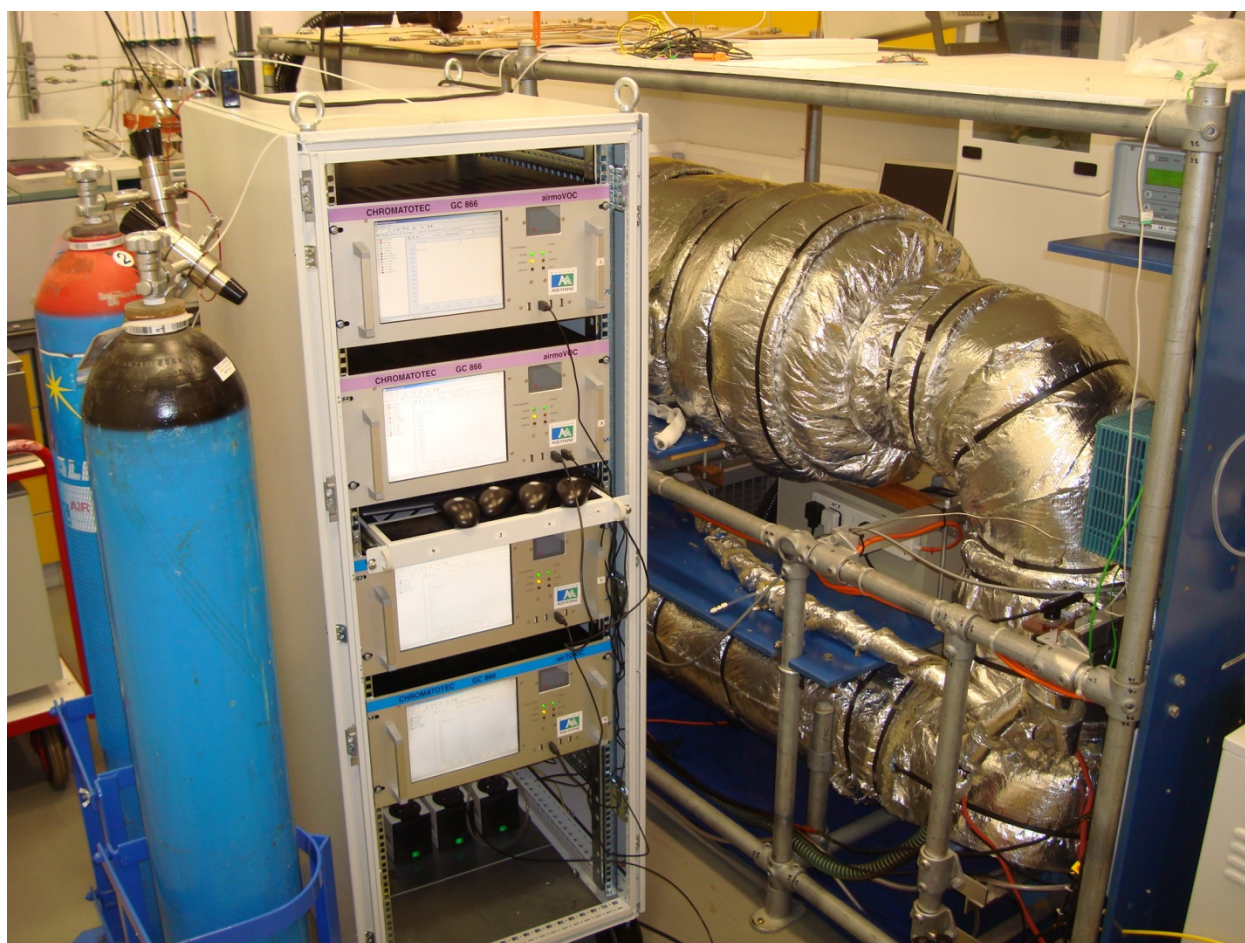


Figure 17: shows all four CAMs in operation, located by NPL's CATFAC for the cross interference test with water vapour.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 18: Photograph showing the zero air generator (Compressor, airmoPURE 45 psi) located outside NPL's environmental chamber, together with determinand gas mixtures being piped to the test manifold.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The laboratory tests carried out were:

- Repeatability (B1)
- Short-term drift (B2)
- Dependence on sample gas pressure (B3)
- Lack of fit (linearity) (B4)
- Carry over (memory effect) (B5)
- Dependence on voltage (B6)
- Dependence on surrounding air temperature (B7)
- Cross interference with ozone (B8)
- Cross interference with water (relative humidity test) (B9)
- Cross interference with organic compounds (B10)

Details of the gas mixtures employed in the tests are recorded in Table 5. The uncertainty of the NPL traceable Standard Gas Mixtures employed to generate each determinand was $\pm 2\%$ ($k=2$). The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The combined uncertainty in the delivery of each determinand concentration taking into account the uncertainty in flow meter calibration, the uncertainty in the repeatability of the determinand flow rate, the uncertainty in the repeatability of the diluent flow rate, and the uncertainty in the diluent flow rate due to temperature changes in the laboratory was $\pm 0.6\%$. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

4.2 Field test programme

The Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), and Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) were subjected to the relevant field tests assigned to the National Physical Laboratory (NPL) in “Proposed Test Programme for MCERTS Certification of CAMs (Revised V3)”, dated 21/04/2009.

The Field Test Programme was proposed by NPL in consultation with airmotec/Chromatotec and was accepted by Sira Environmental Limited. The document took into account the procedures defined in References 1 and 2, and is included in Appendix A. The test results obtained for each CAM were compared to the performance characteristics and performance criteria given in References 1 and 2.

The field tests were conducted in accordance UKAS-accredited NPL Test Procedure QPAS/B/528b, using equipment that was appropriately calibrated. The tests were carried out at

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

the Automatic Urban Rural Network (AURN) monitoring site in Marylebone Road, London W1, which is owned by the UK Department for Environment, Food, and Rural Affairs (DEFRA). A photograph of the site is shown in Figure 19



Figure 19: Automatic Urban Rural Network (AURN) monitoring site in Marylebone Road, London W1

Evidence of the field trial in operation is given in example photographs of the inside of the monitoring site. Figure 20 shows all four CAMs measuring ambient roadside air simultaneously. Figure 21 shows the hydrogen generator employed with the CAMs measuring VOCs with a flame ionisation detector. Figure 22 shows the air generator employed by the CAMs measuring VOCs with a flame ionisation detector. Figure 23 shows the nitrogen cylinder supplying gas to the CAMs employing photoionisation detectors, and for the pneumatic control of valves in all four CAMs. Figure 24 shows the sample manifold originally employed in the laboratory tests, which was again used to distribute the gases to the four CAMs. Finally, Figure 25 shows the validated field sampling manifold, which was also employed by other monitoring instruments in the AURN.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 20: Photograph showing the four CAMs sampling in the field test

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 21: Photograph showing the hydrogen generator employed by CAMs measuring VOCs with a flame ionisation detector.

Reference: E09040018

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Checked by: *W. A. Martin*

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 22: Photograph showing the air generator employed by the CAMs measuring VOCs with a flame ionisation detector.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).



Figure 23: Photograph of nitrogen cylinder supplying gas to the CAMs employing photoionisation detectors, and for the pneumatic control of valves in all four CAMs.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

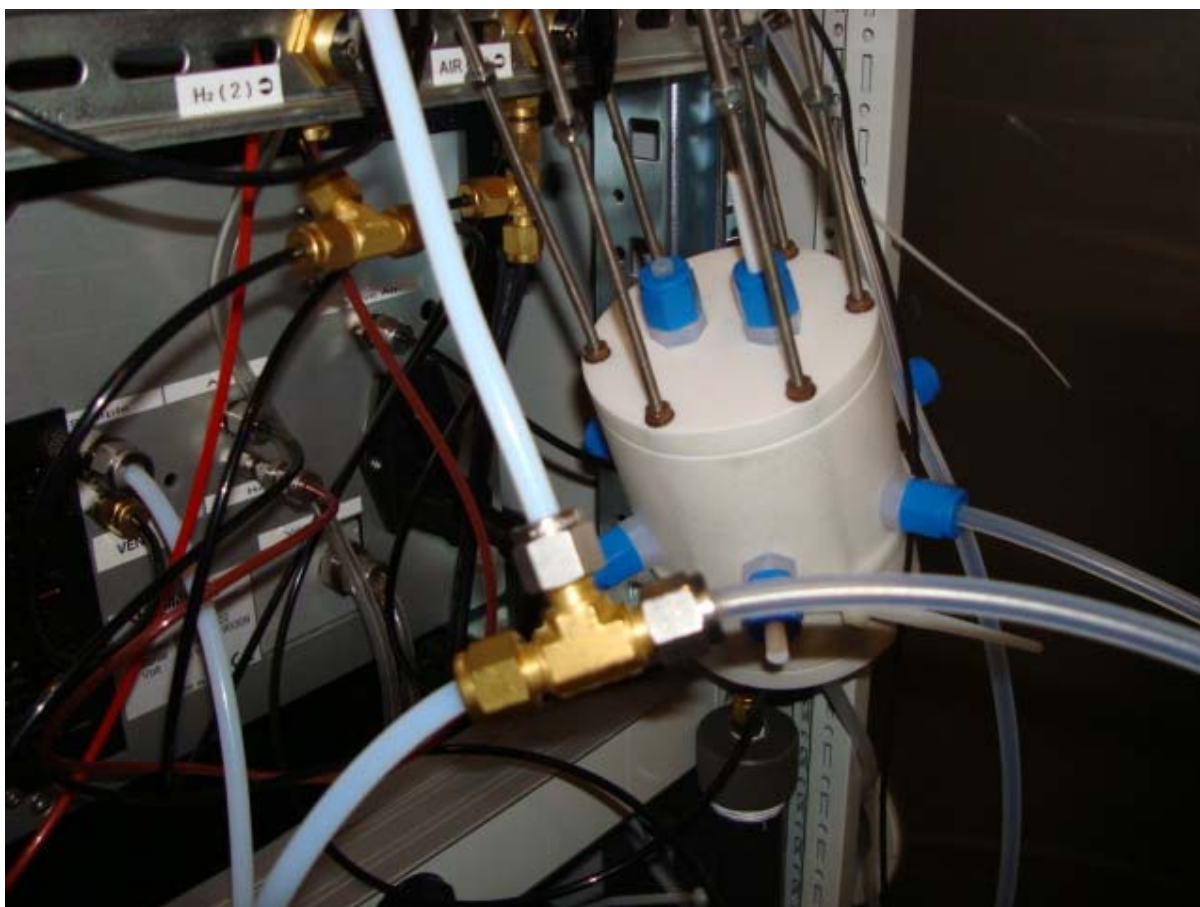


Figure 24: Photograph showing the sample manifold employed in the laboratory to distribute the gases to the four CAMs under test.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

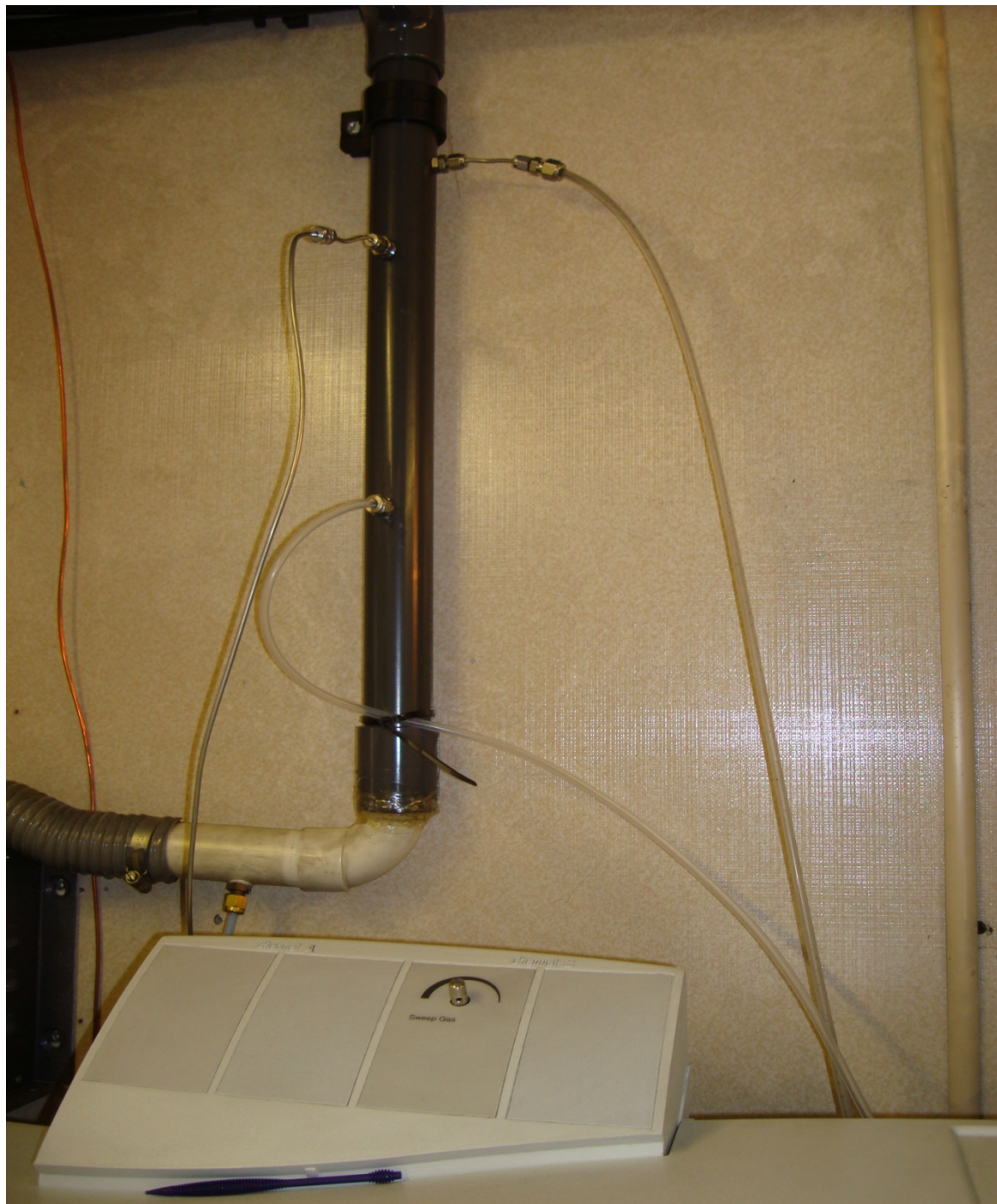


Figure 25: Photograph showing the validated field sampling manifold.

Details of the gas mixtures employed in the tests are recorded in Table 5. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

accordance with UKAS requirements. Calibration gas mixtures were introduced into the CAMs (without further dilution) using a “Restrictor valve”, as described in Section 4.1.

The field tests carried out were:

- Operational requirements (C1)
- Long term drift (C2)
- Maintenance interval (C3)
- Availability (C4)
- Reproducibility standard deviation under field conditions (C5)
- Uncertainty calculation and type approval

5. Laboratory Test Results

The results of the individual performance characteristic tests are given in the following sub-sections.

5.1 Repeatability (B1)

5.1.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion:

Repeatability at $0.5 \mu\text{g m}^{-3}$, determined at 1/10 of the annual mean limit value for benzene,

$$r_{(0.5)} < \pm 0.3 \mu\text{g m}^{-3}$$

Repeatability determined at the annual mean limit value for benzene,

$$r_{(LV)} < \pm 5 \%$$

5.1.2 Additional requirements

Detection limit, as defined in Reference 1, clause Section 9.3.6, determined at 1/10 of the annual mean limit for benzene. No MCERTS pass/fail criterion.

There are also benefits due to reduced sampling requirements if the CAMs meet the repeatability performance criterion by a factor of two or more. In such cases the number of determinand sample injections required in the lack of fit test (B4) may be reduced from 7 to 5 samples.

Repeatability determined at 1/10 of the annual mean limit for benzene,

$$r_{(0.5)} < \pm 0.15 \mu\text{g m}^{-3}$$

Repeatability determined at the annual mean limit value for benzene,

$$r_{LV} < \pm 0.075 \mu\text{g m}^{-3}$$

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

The additional criteria, which are not a part of the performance criteria, were not applied.

5.1.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs.

5.1.4 Testing

This test was carried out at the **limit value** and at **1/10 of the limit value** of benzene, namely $5 \mu\text{g m}^{-3}$ (1.54 ppb) and $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).

A total of 11 successive **valid** determinand sample injections were carried out. The first sample result was rejected. The CAMs sampled ambient air before and after the test. **See Ref 1, clause 8.5.5, and Table 2 (rows 2 and 3, < $0.3 \mu\text{g m}^{-3}$ at 1/10th of the limit value and < 5% at the limit value).**

The **detection limit**, as defined in Ref 1, clause Section 9.3.6, was determined at 1/10 of the limit value.

5.1.5 Evaluation

All four of the CAMs were configured to report concentration values in units of parts per billion (ppb) (equivalent to nmol mol^{-1}) although, if required, this could be changed in software to deliver alternative units.

For the purposes of the data processing carried out in this work it was necessary to obtain concentration units in $\mu\text{g m}^{-3}$, since a number of the performance criteria were defined in such units. This calculation was carried out using the raw data from each CAM (including integrated chromatographic areas, volume of gas sampled, some empirical factors determined during the autocalibration process, and response factors determined by the manufacturer). The procedure is described below, and is common to all the data processing carried out in the laboratory and field tests.

The data recorded by each CAM was automatically archived in a folder labelled with the month that it was acquired. This folder contained three files named: "Retention time", "Results" and "Area", which also contained the date, chromatographic method, and an instrument label. The concentrations reported (in units of ppb) were contained in the "Results" file, while the integrated chromatographic data was stored in the "Area" file.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

A similar procedure was followed to obtain the data contained in the “Retention time” and “Results” files. All the data was then saved onto a USB stick and transferred to a separate NPL personal computer for further processing.

For the two CAMs employing a FID, the layout of the data in the “Area” file was such that in the spread-sheet column A contained a label of the date and time, column B contained the sample volume (ml) data, and columns C to N contained the area data. This was similar for the CAMs employing a PID with the exception that only columns C to G were reserved for the area data.

The next stage of processing involved recovering certain empirical constants from each CAM by loading the “Peak viewer” software and then selecting the “Peak list” tab.

From the list of chromatograms shown on the left of the screen, a relevant chromatogram was selected, and the top window enlarged to reveal the value of the “Base sensitivity” parameter (BS). This parameter was normally measured automatically **once** each day by the internal autocalibration function, which employed a benzene permeation device. However, for this type of CAM, the numerical value of BS was fixed by the manufacturer.

The measured concentration, C_m , of each determinand, obtained from the CAMs employing a FID, is given by:

$$C_m[\mu g.m^{-3}] = RF \cdot \left[\frac{(Area \times 1000)}{(BS \times Volume[ml])} \right]$$

where RF is a response factor of each determinand obtained by the manufacturer, $Area$ is the relevant integrated chromatographic area of each determinand in columns C to N from the file containing areas, BS is the “Base sensitivity”, and $Volume$ is the sample volume in column B.

Table 8 contains the list of the response factors employed to calculate the concentrations (in $\mu g m^{-3}$) for the Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), and Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

The measured concentration, C_n , of each determinand, obtained from the CAMs employing a PID, is given by:

$$C_n[\mu g.m^{-3}] = \left[\frac{\left(RF \cdot \left(\frac{Area}{BS} \right)^{PF} \right)}{Volume[ml]} \right] \times 1000$$

where RF is a response factor of each determinand obtained by the manufacturer, $Area$ is the relevant integrated chromatographic area of each determinand in columns C to G from the file

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

containing areas, *BS* is the “Base sensitivity”, *PF* is the empirically determined power factor, and *Volume* is the sample volume in column B.

Tables 9 and 10 contain the list of the response factors and power factors employed to calculate the concentrations respectively for the Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), and Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509). The parameter *BS* was determined automatically **twice** each day by the internal autocalibration function, which employed a benzene and o-xylene permeation device. For this type of CAM, the numerical value of *PF* was fixed by the manufacturer.

As a further check of the data processing carried out, the calculated concentrations (in $\mu\text{g m}^{-3}$) were then converted into units of parts per billion, and compared against the relevant data (stored in the “Results” file) to confirm that they were identical.

For each CAM the final part of the data processing consisted of determining a series of calibration factors, f_i , for each determinand using:

$$f_i = \frac{C_i}{S_i}$$

where C_i are the known delivered concentrations for each determinand, S_i are the measure values of the concentration for each determinand .

Using the relevant calibration factors the concentration response of each CAM for each determinand, T_i , for was then obtained from:

$$T_i = S_i \times f_i$$

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 8: “Response factors” employed to calculate concentrations Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), and Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Determinand	Response factor, <i>RF</i>
n-hexane	1.05
benzene	1.00
i-octane	1.05
n-heptane	1.06
toluene	1.05
n-octane	1.05
ethyl-benzene	1.10
m-xylene and p-xylene	1.10
o-xylene	1.10
1,3,5-trimethylbenzene	1.12
1,2,4-trimethylbenzene	1.12
1,2,3-trimethylbenzene	1.12

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 9: List of the “response factors” and “power factors” employed to calculate the concentrations for the Chromatotec GC 866 PID airToxic (ModelA73022, serial number 20430309), serial number 20720509

Determinand	Response factor, <i>RF</i>	Power factor, <i>PF</i>
benzene	1.00	1.00
toluene	1.55	0.88
ethyl-benzene	1.95	0.88
m-xylene and p-xylene	1.80	0.81
o-xylene	1.97	0.84

Table 10: List of the “response factors” and “power factors” employed to calculate the concentrations for the Chromatotec GC 866 PID airToxic (ModelA73022, serial number 20430309)

Determinand	Response factor, <i>RF</i>	Power factor, <i>PF</i>
benzene	1.00	1.00
toluene	1.62	0.88
ethyl-benzene	2.05	0.88
m-xylene and p-xylene	1.80	0.81
o-xylene	2.09	0.84

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.1.6 Results

The standard deviation was first calculated, as shown below:

$$S_r(c) = \sqrt{\frac{\sum (C_{testi} - \overline{C_{test}})^2}{n - 1}}$$

$S_r(c)$ = Repeatability standard deviation at the delivered concentration c ,

C_{testi} = the i th individual measurement ($\mu\text{g m}^{-3}$),

$\overline{C_{test}}$ = the average of the all the individual readings,

n = number of individual readings (in this case $n = 10$)

The repeatability was calculated according to:

$$r_i = t_{n-1;0.05} \times S_r(c)$$

Where $t_{n-1;0.05}$ = the two-sided Student's t-factor at a confidence level of 0.05, with $n-1$ degrees of freedom (for $n = 10$, $t_{9;0.05} = 2.262$), $S_r(c)$ = Repeatability standard deviation ($\mu\text{mol mol}^{-1}$).

The detection limit was calculated as shown below:

$$L = (t_{n-1;0.95} \times s_{x0.5})/B$$

L = Detection limit

$t_{n-1;0.95}$ = the Student factor for a 95 % two sided confidence level

$s_{x0.5}$ = the standard deviation for $0.5 \mu\text{g m}^{-3}$

B = the slope of the calibration function

For the repeatability determined at the annual mean limit for benzene, the required performance criterion was expressed as a percentage. The performance criterion, K is defined as:

$$K = \frac{u_r \cdot 100}{C}$$

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

where the repeatability standard uncertainty, u_r , is defined as the repeatability standard deviation, $S_r(c)$, (without any scaling by the two-sided Student's t-factor), and C is the maximum applied concentration (the limit value).

Tables 11, 12, 13, and 14 summarise the results obtained for all four CAMs tested at $1/10^{\text{th}}$ of the annual mean limit concentration value of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Tables 15, 16, 17, and 18 summarise the results obtained for all four CAMs tested at the annual mean limit concentration value of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Tables 19, 20, 21 and 22 summarise the detection limit results obtained for all four CAMs tested at $1/10^{\text{th}}$ of the annual mean limit concentration value of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 11: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10th of benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Delivered Conc / $\mu\text{g m}^{-3}$	0.55	0.50	0.73	0.63	0.58	0.73
$\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
14/04/2010 10:26	0.54	0.53	0.74	0.54	0.47	0.77
14/04/2010 10:56	0.54	0.58	0.74	0.58	0.45	0.76
14/04/2010 11:26	0.53	0.51	0.75	0.57	0.54	0.77
14/04/2010 11:56	0.55	0.55	0.71	0.58	0.56	0.77
14/04/2010 12:26	0.64	0.27	0.51	0.41	0.68	0.80
14/04/2010 12:56	0.54	0.59	0.44	0.50	0.50	0.87
14/04/2010 13:26	0.53	0.40	0.24	0.22	0.49	0.95
14/04/2010 13:56	0.61	0.46	0.67	0.64	0.36	0.70
14/04/2010 14:26	1.26	0.55	0.53	0.23	0.25	0.78
14/04/2010 14:56	0.53	0.51	0.65	0.74	0.31	0.76
14/04/2010 15:26	0.51	0.49	0.40	0.64	0.54	0.84
14/04/2010 15:56	0.55	0.50	0.73	0.63	0.58	0.73
MEAN / $\mu\text{g m}^{-3}$	0.63	0.48	0.56	0.52	0.48	0.80
STDEV / $\mu\text{g m}^{-3}$	0.23	0.09	0.17	0.18	0.13	0.07
Repeatability / $\mu\text{g m}^{-3}$	0.51	0.20	0.38	0.40	0.30	0.16

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 11 (continued): Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10th of benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).						
Delivered Conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
	0.68	1.36	0.68	0.79	0.77	0.74
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
	14/04/2010 10:26	0.65	1.26	0.72	0.57	0.67
	14/04/2010 10:56	0.63	1.35	0.72	0.79	0.70
	14/04/2010 11:26	0.69	1.39	0.76	0.81	0.61
	14/04/2010 11:56	0.78	1.56	0.68	0.84	0.69
	14/04/2010 12:26	0.75	1.41	0.68	0.78	0.68
	14/04/2010 12:56	0.54	1.33	0.66	0.79	0.65
	14/04/2010 13:26	0.54	1.27	0.63	0.93	0.67
	14/04/2010 13:56	0.72	1.41	0.60	0.69	0.64
	14/04/2010 14:26	0.85	1.45	0.67	0.75	0.76
	14/04/2010 14:56	0.65	1.31	0.76	0.71	0.61
	14/04/2010 15:26	0.70	1.25	0.68	0.71	0.79
	14/04/2010 15:56	0.68	1.36	0.68	0.79	0.77
MEAN / $\mu\text{g m}^{-3}$	0.69	1.37	0.68	0.78	0.69	0.55
STDEV / $\mu\text{g m}^{-3}$	0.10	0.09	0.05	0.07	0.07	0.07
Repeatability / $\mu\text{g m}^{-3}$	0.22	0.10	0.11	0.16	0.15	0.17

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 12: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene)).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) carried out at 1/10th of benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).						
Delivered Conc / ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	0.55	0.50	0.73	0.63	0.58	0.73
ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
14/04/2010 10:26	0.56	0.55	0.75	0.69	0.65	0.72
14/04/2010 10:56	0.54	0.59	0.74	0.66	0.55	0.77
14/04/2010 11:26	0.55	0.53	0.76	0.65	0.61	0.73
14/04/2010 11:56	0.55	0.58	0.73	0.66	0.68	0.74
14/04/2010 12:26	0.57	0.55	0.78	0.63	0.60	0.75
14/04/2010 12:56	0.55	0.55	0.77	0.65	0.59	0.72
14/04/2010 13:26	0.54	0.58	0.72	0.65	0.65	0.72
14/04/2010 13:56	0.55	0.54	0.75	0.66	0.60	0.76
14/04/2010 14:26	0.53	0.58	0.77	0.69	0.61	0.74
14/04/2010 14:56	0.54	0.54	0.76	0.64	0.63	0.75
14/04/2010 15:26	0.54	0.55	0.79	0.67	0.59	0.77
14/04/2010 15:56	0.55	0.50	0.73	0.63	0.58	0.73
MEAN / ug m ⁻³	0.55	0.55	0.76	0.65	0.61	0.74
STDEV / ug m ⁻³	0.01	0.02	0.02	0.02	0.03	0.02
Repeatability / ug m ⁻³	0.02	0.06	0.05	0.04	0.06	0.04

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 12 (continued): Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at 1/10th of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene)).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) carried out at 1/10th of benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
		0.68	1.36	0.68	0.79	0.77	0.74
Delivered Conc / ug m ⁻³							
ug m ⁻³		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
14/04/2010 10:26		0.64	1.28	0.68	0.74	0.71	0.90
14/04/2010 10:56		0.68	1.37	0.68	0.80	0.85	0.89
14/04/2010 11:26		0.69	1.37	0.68	0.80	0.91	0.93
14/04/2010 11:56		0.68	1.37	0.69	0.80	0.80	0.87
14/04/2010 12:26		0.72	1.38	0.69	0.80	0.85	0.81
14/04/2010 12:56		0.69	1.36	0.69	0.78	0.80	0.82
14/04/2010 13:26		0.71	1.41	0.68	0.81	0.83	0.79
14/04/2010 13:56		0.71	1.37	0.69	0.80	0.80	0.74
14/04/2010 14:26		0.69	1.45	0.69	0.77	0.83	0.81
14/04/2010 14:56		0.72	1.40	0.70	0.79	0.79	0.74
14/04/2010 15:26		0.66	1.34	0.69	0.79	0.82	0.75
14/04/2010 15:56		0.68	1.36	0.68	0.79	0.77	0.74
MEAN / ug m ⁻³		0.70	1.38	0.69	0.79	0.82	0.80
STDEV / ug m ⁻³		0.02	0.03	0.00	0.01	0.04	0.07
Repeatability / ug m ⁻³		0.04	0.03	0.01	0.03	0.09	0.15

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 13: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) carried out at 1/10th of benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).				
Delivered Conc / $\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	O-XYLENE
	0.50	0.58	0.68	0.68
$\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	O-XYLENE
14/04/2010 10:26	0.63	0.57	0.64	1.12
14/04/2010 10:56	0.51	0.59	0.67	0.77
14/04/2010 11:26	0.49	0.57	0.65	0.69
14/04/2010 11:56	0.51	0.59	0.68	0.70
14/04/2010 12:26	0.48	0.57	0.66	0.67
14/04/2010 12:56	0.49	0.59	0.68	0.68
14/04/2010 13:26	0.48	0.57	0.66	0.66
14/04/2010 13:56	0.50	0.58	0.68	0.68
14/04/2010 14:26	0.49	0.57	0.66	0.66
14/04/2010 14:56	0.49	0.58	0.68	0.67
14/04/2010 15:26	0.48	0.57	0.66	0.66
14/04/2010 15:56	0.50	0.58	0.68	0.68
MEAN / $\mu\text{g m}^{-3}$	0.49	0.58	0.67	0.68
STDEV / $\mu\text{g m}^{-3}$	0.01	0.01	0.01	0.01
Repeatability / $\mu\text{g m}^{-3}$	0.02	0.02	0.03	0.03

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 14: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) carried out at 1/10th of benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered Conc / $\mu\text{g m}^{-3}$	0.50	0.58	0.68	1.36	0.68	
$\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
14/04/2010 10:26	0.80	0.59	0.66	1.26	1.83	
14/04/2010 10:56	0.53	0.60	0.68	1.34	0.86	
14/04/2010 11:26	0.54	0.62	0.68	1.34	0.74	
14/04/2010 11:56	0.54	0.59	0.70	1.38	0.70	
14/04/2010 12:26	0.52	0.59	0.68	1.35	0.71	
14/04/2010 12:56	0.51	0.60	0.68	1.37	0.68	
14/04/2010 13:26	0.52	0.61	0.69	1.33	0.68	
14/04/2010 13:56	0.51	0.59	0.69	1.38	0.70	
14/04/2010 14:26	0.52	0.60	0.68	1.34	0.67	
14/04/2010 14:56	0.52	0.61	0.68	1.38	0.69	
14/04/2010 15:26	0.51	0.62	0.68	1.36	0.68	
14/04/2010 15:56	0.50	0.58	0.68	1.36	0.68	
MEAN / $\mu\text{g m}^{-3}$	0.52	0.60	0.69	1.36	0.69	
STDEV / $\mu\text{g m}^{-3}$	0.01	0.01	0.01	0.02	0.02	
Repeatability / $\mu\text{g m}^{-3}$	0.03	0.03	0.01	0.02	0.05	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 15: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).									
Delivered Conc / $\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE*	N-HEPTANE	TOLUENE	N-OCTANE			
	5.47	4.98	7.29	6.28	5.81	7.22			
$\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
13/04/2010 10:56	5.47	4.91	7.15	6.21	5.49	6.92			
13/04/2010 11:26	5.52	4.99	7.23	6.30	5.81	7.36			
13/04/2010 11:56	5.48	4.94	7.10	6.28	5.74	7.35			
13/04/2010 12:26	5.48	4.93	7.17	6.26	6.24	7.20			
13/04/2010 12:56	5.51	5.04	7.23	6.19	5.80	7.41			
13/04/2010 13:26	5.47	4.98	7.32	6.31	6.16	6.82			
13/04/2010 13:56	5.46	4.79	7.21	6.28	6.13	7.42			
13/04/2010 14:26	5.50	5.03	7.25	6.35	6.11	7.37			
13/04/2010 14:56	5.59	4.98	7.21	6.32	5.94	7.37			
13/04/2010 15:26	5.52	4.93	7.18	6.29	6.00	7.44			
13/04/2010 15:56	5.47	4.91	7.22	6.32	6.11	7.30			
13/04/2010 16:26	5.47	4.98	7.29	6.28	5.81	7.22			
MEAN / $\mu\text{g m}^{-3}$	5.49	4.95	7.22	6.29	6.00	7.29			
STDEV / $\mu\text{g m}^{-3}$	0.04	0.07	0.06	0.04	0.17	0.18			
Rep. std. Uncert. / $\mu\text{g m}^{-3}$	0.04	0.07	0.06	0.04	0.17	0.18			
Rep. At Limit Value / %	0.71	1.42	0.86	0.69	2.98	2.55			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 15 (continued): Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).									
Delivered Conc / ug m ⁻³	ETHYLBENZENE	M&P-XYLENES**	O-XYLENE	135-TMB	124-TMB	123-TMB			
	6.78	13.51	6.78	7.83	7.67	7.31			
	ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
	13/04/2010 10:56	6.29	12.12	6.27	6.63	5.73	5.70		
	13/04/2010 11:26	6.54	12.72	6.68	6.77	6.46	6.05		
	13/04/2010 11:56	6.59	12.66	6.79	7.71	7.49	6.89		
	13/04/2010 12:26	6.51	12.82	6.77	7.62	7.53	6.93		
	13/04/2010 12:56	6.64	12.80	6.70	7.69	7.56	7.11		
	13/04/2010 13:26	6.72	13.25	6.72	7.80	7.62	7.19		
	13/04/2010 13:56	6.69	13.01	6.30	7.35	7.83	7.23		
	13/04/2010 14:26	6.58	12.74	6.66	7.15	7.82	7.16		
	13/04/2010 14:56	6.77	13.33	6.78	7.85	7.67	7.23		
	13/04/2010 15:26	6.64	12.92	6.77	7.98	7.69	7.32		
13/04/2010 15:56	6.72	12.92	6.67	7.86	7.67	7.34			
13/04/2010 16:26	6.78	13.51	6.78	7.83	7.67	7.31			
MEAN / ug m ⁻³	6.66	13.00	6.69	7.68	7.66	7.17			
STDEV / ug m ⁻³	0.09	0.28	0.15	0.25	0.11	0.16			
Rep. std. Uncert. / ug m-3	0.09	0.28	0.15	0.25	0.11	0.16			
Rep. At Limit Value / %	1.30	2.07	2.16	3.25	1.45	2.14			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 16: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Delivered Conc / $\mu\text{g m}^{-3}$	5.47	4.98	7.29	6.28	5.81	7.22
$\mu\text{g m}^{-3}$						
13/04/2010 10:56	5.46	4.96	7.29	6.18	5.58	7.06
13/04/2010 11:26	5.50	4.97	7.34	6.23	5.83	7.14
13/04/2010 11:56	5.52	4.95	7.31	6.23	5.68	7.29
13/04/2010 12:26	5.44	4.97	7.31	6.22	5.79	7.22
13/04/2010 12:56	5.45	4.98	7.28	6.25	5.85	7.20
13/04/2010 13:26	5.47	5.01	7.39	6.16	5.79	7.28
13/04/2010 13:56	5.49	5.03	7.29	6.20	5.82	7.17
13/04/2010 14:26	5.50	5.00	7.35	6.28	5.87	7.20
13/04/2010 14:56	5.50	5.04	7.32	6.24	5.87	7.30
13/04/2010 15:26	5.47	4.97	7.36	6.26	5.85	7.20
13/04/2010 15:56	5.50	4.90	7.27	6.26	5.78	7.30
13/04/2010 16:26	5.47	4.98	7.29	6.28	5.81	7.22
MEAN / $\mu\text{g m}^{-3}$	5.48	4.98	7.32	6.24	5.81	7.24
STDEV / $\mu\text{g m}^{-3}$	0.02	0.04	0.04	0.04	0.06	0.05
Rep. At Limit Value / %	1.01	1.84	1.19	1.37	2.25	1.51

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 16 (continued): Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).												
Delivered Conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB						
	6.78	13.51	6.78	7.83	7.67	7.31						
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB						
	13/04/2010 10:56	12.54	6.35	6.73	6.04	6.03						
	13/04/2010 11:26	13.10	6.64	7.47	7.18	6.91						
	13/04/2010 11:56	13.40	6.77	7.65	7.37	7.17						
	13/04/2010 12:26	13.55	6.71	7.65	7.43	7.19						
	13/04/2010 12:56	13.36	6.73	7.74	7.49	7.25						
	13/04/2010 13:26	13.41	6.76	7.83	7.59	7.35						
	13/04/2010 13:56	13.77	6.80	7.82	7.59	7.28						
	13/04/2010 14:26	13.64	6.78	7.83	7.63	7.24						
	13/04/2010 14:56	13.59	6.82	7.84	7.63	7.31						
MEAN / $\mu\text{g m}^{-3}$	13/04/2010 15:26	13.86	6.84	7.83	7.64	7.26						
	13/04/2010 15:56	13.78	6.84	7.84	7.66	7.30						
STDEV / $\mu\text{g m}^{-3}$	13/04/2010 16:26	13.51	6.78	7.83	7.67	7.31						
	6.79	13.59	6.78	7.79	7.57	7.27						
Repeatability as % of FS	0.04	0.17	0.04	0.08	0.10	0.06						
	1.43	1.45	1.40	2.22	3.03	1.71						

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 17: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).						
Delivered Conc / $\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
	4.98	5.81	6.78	13.51	6.78	
$\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
13/04/2010 10:56	4.84	5.44	6.30	12.46	6.46	
13/04/2010 11:26	4.96	5.68	6.70	13.36	6.81	
13/04/2010 11:56	4.81	5.55	6.54	13.06	6.65	
13/04/2010 12:26	4.96	5.74	6.77	13.59	6.89	
13/04/2010 12:56	4.81	5.52	6.55	13.02	6.65	
13/04/2010 13:26	4.95	5.67	6.69	13.32	6.84	
13/04/2010 13:56	4.84	5.60	6.63	13.23	6.74	
13/04/2010 14:26	5.01	5.80	6.88	13.87	6.97	
13/04/2010 14:56	4.80	5.52	6.57	13.07	6.66	
13/04/2010 15:26	4.97	5.70	6.77	13.51	6.82	
13/04/2010 15:56	4.88	5.65	6.69	13.40	6.78	
13/04/2010 16:26	4.98	5.81	6.78	13.51	6.78	
MEAN / $\mu\text{g m}^{-3}$	4.90	5.65	6.69	13.36	6.78	
STDEV / $\mu\text{g m}^{-3}$	0.08	0.11	0.12	0.27	0.11	
Repeatability as % of FS	3.74	4.20	3.84	2.28	3.57	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 18: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene annual mean limit concentration value (and the concentration values agreed by the certification body for determinands other than benzene).				
Delivered Conc / $\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	O-XYLENE
	4.98	5.81	6.78	6.78
$\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	O-XYLENE
13/04/2010 10:56	4.84	5.49	6.16	6.32
13/04/2010 11:26	4.96	5.71	6.62	6.84
13/04/2010 11:56	4.91	5.70	6.63	6.77
13/04/2010 12:26	4.94	5.75	6.71	6.76
13/04/2010 12:56	4.90	5.68	6.65	6.72
13/04/2010 13:26	4.95	5.78	6.76	6.93
13/04/2010 13:56	4.93	5.75	6.72	6.89
13/04/2010 14:26	4.99	5.82	6.82	6.87
13/04/2010 14:56	4.94	5.73	6.72	6.76
13/04/2010 15:26	4.94	5.80	6.80	6.82
13/04/2010 15:56	4.91	5.77	6.75	6.91
13/04/2010 16:26	4.98	5.81	6.78	6.78
MEAN / $\mu\text{g m}^{-3}$	4.94	5.76	6.73	6.82
STDEV / $\mu\text{g m}^{-3}$	0.03	0.04	0.06	0.07
Repeatability as % of FS	1.34	1.74	2.06	2.44

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 19: Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
14/04/2010 10:26	0.47	0.36	0.50	0.41	0.39	0.53
14/04/2010 10:56	0.46	0.39	0.50	0.44	0.37	0.53
14/04/2010 11:26	0.45	0.34	0.50	0.43	0.45	0.54
14/04/2010 11:56	0.47	0.37	0.48	0.44	0.46	0.54
14/04/2010 12:26	0.55	0.18	0.35	0.31	0.56	0.56
14/04/2010 12:56	0.46	0.39	0.30	0.38	0.42	0.61
14/04/2010 13:26	0.46	0.27	0.17	0.17	0.41	0.66
14/04/2010 13:56	0.52	0.31	0.45	0.48	0.30	0.49
14/04/2010 14:26	1.08	0.37	0.36	0.17	0.21	0.55
14/04/2010 14:56	0.45	0.34	0.44	0.56	0.25	0.53
14/04/2010 15:26	0.43	0.33	0.27	0.48	0.45	0.58
14/04/2010 15:56	0.47	0.34	0.50	0.48	0.48	0.51
14/04/2010 16:26	0.46	0.64	0.19	0.37	0.42	0.64
14/04/2010 16:56	2.81	2.87	3.53	3.01	3.61	3.39
14/04/2010 17:26	0.00	0.59	0.00	0.00	1.05	0.18
MEAN / ug m-3	0.54	0.32	0.38	0.39	0.40	0.56

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 19 (continued): Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
14/04/2010 10:26	0.54	1.09	0.60	0.50	0.70	0.56			
14/04/2010 10:56	0.52	1.17	0.60	0.69	0.73	0.58			
14/04/2010 11:26	0.57	1.21	0.64	0.71	0.65	0.63			
14/04/2010 11:56	0.65	1.35	0.57	0.73	0.72	0.75			
14/04/2010 12:26	0.62	1.22	0.57	0.68	0.72	0.67			
14/04/2010 12:56	0.45	1.16	0.56	0.69	0.68	0.68			
14/04/2010 13:26	0.45	1.10	0.53	0.81	0.70	0.64			
14/04/2010 13:56	0.60	1.22	0.51	0.60	0.67	0.71			
14/04/2010 14:26	0.71	1.26	0.56	0.65	0.80	0.63			
14/04/2010 14:56	0.54	1.14	0.64	0.62	0.64	0.60			
14/04/2010 15:26	0.58	1.08	0.58	0.62	0.83	0.60			
14/04/2010 15:56	0.57	1.18	0.57	0.69	0.81	0.91			
14/04/2010 16:26	0.57	1.10	0.51	0.70	0.79	0.57			
14/04/2010 16:56	3.70	7.63	3.95	3.34	3.39	2.59			
14/04/2010 17:26	0.46	1.05	0.57	0.64	1.54	1.38			
MEAN / ug m-3	0.57	1.19	0.57	0.68	0.72	0.68			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 20: Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
14/04/2010 10:26	0.50	0.40	0.62	0.54	0.48	0.60
14/04/2010 10:56	0.48	0.43	0.61	0.51	0.40	0.64
14/04/2010 11:26	0.49	0.38	0.63	0.50	0.44	0.60
14/04/2010 11:56	0.49	0.42	0.60	0.51	0.49	0.61
14/04/2010 12:26	0.51	0.40	0.64	0.49	0.44	0.62
14/04/2010 12:56	0.49	0.40	0.64	0.51	0.43	0.59
14/04/2010 13:26	0.48	0.42	0.60	0.51	0.47	0.60
14/04/2010 13:56	0.50	0.39	0.62	0.52	0.44	0.63
14/04/2010 14:26	0.48	0.42	0.64	0.54	0.44	0.61
14/04/2010 14:56	0.48	0.39	0.63	0.49	0.46	0.62
14/04/2010 15:26	0.48	0.40	0.66	0.52	0.43	0.64
14/04/2010 15:56	0.49	0.36	0.61	0.49	0.43	0.60
14/04/2010 16:26	0.49	0.39	0.60	0.50	0.45	0.59
14/04/2010 16:56	3.13	3.05	3.99	3.31	3.84	3.78
14/04/2010 17:26	0.13	0.45	0.14	0.00	1.07	0.20
MEAN / ug m-3	0.49	0.40	0.62	0.51	0.45	0.61

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 20 (continued): Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
14/04/2010 10:26	0.56	1.20	0.58	0.75	0.70	1.07	0.70	1.07	1.07
14/04/2010 10:56	0.59	1.28	0.58	0.81	0.83	1.07	0.83	1.07	1.07
14/04/2010 11:26	0.60	1.28	0.58	0.81	0.90	1.11	0.90	1.11	1.11
14/04/2010 11:56	0.59	1.28	0.59	0.81	0.79	1.04	0.79	1.04	1.04
14/04/2010 12:26	0.62	1.29	0.59	0.81	0.83	0.97	0.83	0.97	0.97
14/04/2010 12:56	0.60	1.28	0.59	0.79	0.78	0.98	0.78	0.98	0.98
14/04/2010 13:26	0.61	1.32	0.58	0.82	0.81	0.95	0.81	0.95	0.95
14/04/2010 13:56	0.61	1.28	0.59	0.81	0.79	0.88	0.79	0.88	0.88
14/04/2010 14:26	0.59	1.36	0.58	0.78	0.82	0.97	0.82	0.97	0.97
14/04/2010 14:56	0.62	1.31	0.59	0.80	0.78	0.88	0.78	0.88	0.88
14/04/2010 15:26	0.57	1.26	0.59	0.80	0.81	0.89	0.81	0.89	0.89
14/04/2010 15:56	0.59	1.27	0.58	0.80	0.76	0.88	0.76	0.88	0.88
14/04/2010 16:26	0.60	1.35	0.58	0.80	0.77	0.84	0.77	0.84	0.84
14/04/2010 16:56	4.02	8.53	4.35	4.01	3.64	2.94	3.64	2.94	2.94
14/04/2010 17:26	0.38	1.00	0.58	0.69	1.59	1.57	1.59	1.57	1.57
MEAN / ug m-3	0.60	1.29	0.59	0.80	0.81	0.95	0.81	0.95	0.95

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 21: Detection limit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Detection limit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).					
ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
14/04/2010 10:26	0.46	0.59	0.76	1.53	1.41
14/04/2010 10:56	0.37	0.61	0.79	1.63	0.97
14/04/2010 11:26	0.36	0.59	0.77	1.56	0.87
14/04/2010 11:56	0.37	0.61	0.80	1.67	0.88
14/04/2010 12:26	0.35	0.59	0.78	1.59	0.84
14/04/2010 12:56	0.36	0.61	0.80	1.67	0.85
14/04/2010 13:26	0.35	0.59	0.78	1.59	0.82
14/04/2010 13:56	0.37	0.60	0.80	1.66	0.86
14/04/2010 14:26	0.35	0.58	0.78	1.59	0.84
14/04/2010 14:56	0.36	0.60	0.80	1.65	0.84
14/04/2010 15:26	0.35	0.59	0.78	1.59	0.83
14/04/2010 15:56	0.37	0.60	0.80	1.66	0.86
14/04/2010 16:26	0.34	0.59	0.78	1.58	0.82
14/04/2010 16:56	2.83	4.26	4.93	8.99	4.52
14/04/2010 17:26	0.46	1.30	0.46	1.29	0.54
MEAN / ug m-3	0.36	0.60	0.79	1.62	0.85

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 22: Detection limit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Detection limit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
14/04/2010 10:26	0.56	0.52	0.66	1.23	1.88	
14/04/2010 10:56	0.37	0.52	0.68	1.31	0.88	
14/04/2010 11:26	0.38	0.54	0.69	1.31	0.76	
14/04/2010 11:56	0.37	0.52	0.70	1.35	0.72	
14/04/2010 12:26	0.36	0.51	0.68	1.32	0.73	
14/04/2010 12:56	0.35	0.52	0.68	1.34	0.70	
14/04/2010 13:26	0.36	0.53	0.69	1.30	0.70	
14/04/2010 13:56	0.35	0.52	0.70	1.35	0.72	
14/04/2010 14:26	0.36	0.53	0.68	1.30	0.68	
14/04/2010 14:56	0.36	0.53	0.69	1.34	0.71	
14/04/2010 15:26	0.35	0.55	0.68	1.32	0.70	
14/04/2010 15:56	0.35	0.51	0.69	1.33	0.70	
14/04/2010 16:26	0.35	0.53	0.68	1.29	0.68	
14/04/2010 16:56	2.94	4.14	4.46	8.03	4.13	
14/04/2010 17:26	0.49	1.26	0.47	1.20	0.53	
MEAN / ug m-3	0.36	0.53	0.69	1.33	0.71	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.1.7 Assessment

Repeatability at 1/10th the limit concentration

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene; 1,2,3-trimethylbenzene.

Additional performance criterion **not met** for the determinands: n-hexane.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane, 2,2,4-trimethyl pentane

Additional performance criterion **not met** for the determinands: n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Repeatability at the limit concentration

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.2 Short-term drift (24 hours) at span value (B2)

5.2.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Short-term drift (24 hours) at the span concentration value (between 70% and 90% of the certification range) for benzene,

$$d_{24h} < \pm 5 \%$$

5.2.2 Additional requirements

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.2.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs.

5.2.4 Testing

The test was carried out at the **span** value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test employed a **known** concentration of nominally 13.9 ppb.

A total of 5 **valid** determinand sample injections were carried out. The first sample result was rejected. The test was repeated again after 24 hours. The CAMs sampled ambient air before and after the test.

5.2.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

5.2.6 Results

The short-term drift at span level was calculated as follows:

$$d_{24h} = \frac{|\bar{c}_n - \bar{c}_{n-1}|}{\bar{c}_n} \times 100\%$$

where

d_{24h} is the drift at span concentration c_t as a percentage;

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

c_n is the average of the 4 analyses at the beginning of the drift period

c_{n-1} is the average of the 4 analyses at the end of the drift period (24 hours)

The uncertainty u_s due to short term drift was calculated as follows:

$$u_s = \frac{|c_n - c_{n-1}|}{2\sqrt{3}}$$

where

c_n is the average of the 4 analyses at the beginning of the drift period

c_{n-1} is the average of the 4 analyses at the end of the drift period (24 hours)

Tables 23, 24, 25 and 26 summarise the results obtained for the 24 hour drift test for all four CAMs at the span concentration.

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 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 23: Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Beginning of drift period.						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Delivered Conc $\mu\text{g m}^{-3}$	49.01	44.60	65.22	56.09	51.99	64.71
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
$\mu\text{g m}^{-3}$	0.00	0.37	0.00	0.00	0.66	0.00
08/04/2010 11:26	49.04	43.92	65.65	56.07	49.59	64.17
08/04/2010 11:56	49.24	44.46	65.83	56.09	51.56	65.40
08/04/2010 12:26	49.07	44.62	65.46	56.75	51.72	65.49
08/04/2010 12:56	48.82	44.44	65.30	55.70	51.40	64.79
08/04/2010 13:26	49.01	44.60	65.22	56.09	51.99	64.71
08/04/2010 13:56						
MEAN / $\mu\text{g m}^{-3}$	49.04	44.53	65.45	56.16	51.67	65.10
STDEV / $\mu\text{g m}^{-3}$	0.17	0.09	0.27	0.44	0.25	0.41

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). End of drift period.						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Delivered Conc ug m ⁻³	49.65	45.18	66.08	56.83	52.67	65.56
ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
09/04/2010 09:26	1.02	2.20	0.23	0.81	9.38	0.64
09/04/2010 09:56	49.27	44.99	66.23	56.24	51.92	65.63
09/04/2010 10:26	49.49	44.80	66.19	55.55	52.49	66.15
09/04/2010 10:56	49.58	44.31	66.37	56.43	53.19	67.00
09/04/2010 11:26	49.70	44.42	66.32	57.13	52.70	68.18
09/04/2010 11:56	49.50	44.85	66.15	56.39	52.63	68.29
MEAN / ug m ⁻³	49.56	44.59	66.26	56.37	52.75	67.40
STDEV / ug m ⁻³	0.10	0.27	0.10	0.65	0.31	1.02
Drift / %	1.08	0.15	1.23	0.39	2.10	3.54
Drift Uncertainty / ug m ⁻³	4.22	0.02	0.23	0.06	0.31	0.67

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 23 (continued): Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Beginning of drift period.									
		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
Delivered Conc $\mu\text{g m}^{-3}$		60.86	121.23	59.90	64.57	64.84	63.22		
		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
$\mu\text{g m}^{-3}$		0.00	0.32	0.27	0.00	0.41	0.00		
08/04/2010 11:26		57.76	113.54	55.75	53.02	52.00	48.21		
08/04/2010 11:56		60.41	119.76	59.11	61.31	61.00	58.41		
08/04/2010 12:26		61.04	121.32	60.01	63.27	63.32	61.16		
08/04/2010 12:56		61.00	121.46	60.07	64.01	64.23	62.69		
08/04/2010 13:26		60.86	121.23	59.90	64.57	64.84	63.22		
08/04/2010 13:56									
MEAN / $\mu\text{g m}^{-3}$		60.83	120.94	59.77	63.29	63.35	61.37		
STDEV / $\mu\text{g m}^{-3}$		0.29	0.79	0.45	1.42	1.68	2.16		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). End of drift period.						
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
Delivered Conc ug m ⁻³	61.66	122.82	60.69	65.42	65.69	64.05
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
ug m ⁻³						
09/04/2010 09:26	1.33	3.62	1.10	0.44	1.69	0.53
09/04/2010 09:56	57.95	113.90	55.89	53.43	51.88	47.57
09/04/2010 10:26	61.12	121.30	59.73	61.79	61.48	58.89
09/04/2010 10:56	61.93	123.19	60.86	64.26	64.16	62.47
09/04/2010 11:26	62.08	123.79	61.06	65.22	65.66	63.83
09/04/2010 11:56	62.20	124.01	61.24	65.63	66.18	65.04
MEAN / ug m ⁻³	61.83	123.07	60.72	64.23	64.37	62.56
STDEV / ug m ⁻³	0.49	1.23	0.68	1.72	2.11	2.66
Drift / %	1.65	1.76	1.59	1.48	1.62	1.94
Drift Uncertainty / ug m ⁻³	0.29	0.61	0.28	0.27	0.30	0.34

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 24: Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Beginning of drift period.							
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
Delivered Conc	49.01	44.60	65.22	56.09	51.99	64.71	
ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
08/04/2010 11:26	0.00	0.37	0.15	1.51	0.76	0.00	
08/04/2010 11:56	49.44	44.65	65.34	55.99	51.15	63.62	
08/04/2010 12:26	49.44	44.53	65.58	56.08	52.06	64.97	
08/04/2010 12:56	49.17	44.71	65.47	56.14	52.05	65.06	
08/04/2010 13:26	49.15	44.29	65.31	55.98	52.00	64.97	
08/04/2010 13:56	49.01	44.60	65.22	56.09	51.99	64.71	
MEAN / ug m ⁻³	49.19	44.53	65.40	56.07	52.02	64.93	
STDEV / ug m ⁻³	0.18	0.18	0.16	0.07	0.04	0.15	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). End of drift period.						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Delivered Conc	49.65	45.18	66.08	56.83	52.67	65.56
ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
09/04/2010 09:26	1.12	2.18	0.95	0.84	9.28	0.65
09/04/2010 09:56	49.99	45.13	66.22	56.80	51.96	64.96
09/04/2010 10:26	50.21	45.18	66.67	57.24	51.59	66.14
09/04/2010 10:56	50.26	45.24	66.68	57.06	53.07	66.39
09/04/2010 11:26	49.91	45.76	66.75	57.35	53.17	66.37
09/04/2010 11:56	49.96	45.19	66.71	57.45	53.10	66.16
MEAN / ug m ⁻³	50.08	45.34	66.70	57.27	52.73	66.26
STDEV / ug m ⁻³	0.18	0.28	0.04	0.17	0.76	0.13
Drift / %	1.81	1.82	2.00	2.14	1.36	2.06
Drift Uncertainty / ug m ⁻³	0.26	0.23	0.38	0.35	0.20	0.39

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 24 (continued): Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene)).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene)). Beginning of drift period.									
Delivered Conc	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	ug m ⁻³		
	60.86	121.23	59.90	64.57	64.84	63.22			
08/04/2010 11:26	0.00	0.32	0.25	0.19	0.26	0.72			
08/04/2010 11:56	57.57	111.11	51.35	54.78	52.03	49.26			
08/04/2010 12:26	60.34	119.88	59.13	62.03	60.90	58.98			
08/04/2010 12:56	60.66	120.78	59.66	63.44	62.99	61.48			
08/04/2010 13:26	60.73	121.01	59.75	64.06	63.88	62.49			
08/04/2010 13:56	60.86	121.23	59.90	64.57	64.84	63.22			
MEAN / ug m ⁻³	60.65	120.72	59.61	63.52	63.15	61.54			
STDEV / ug m ⁻³	0.22	0.59	0.33	1.10	1.68	1.85			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309, carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). End of drift period.

	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
Delivered Conc	61.66	122.82	60.69	65.42	65.69	64.05

	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
09/04/2010 09:26	1.36	3.56	1.04	0.56	1.58	0.00
09/04/2010 09:56	58.13	112.14	51.79	55.17	52.29	48.58
09/04/2010 10:26	61.34	121.81	60.05	63.03	61.74	59.61
09/04/2010 10:56	61.88	123.15	60.81	64.60	64.22	62.43
09/04/2010 11:26	62.06	123.83	61.24	65.71	65.32	63.76
09/04/2010 11:56	62.10	123.90	61.22	65.78	65.84	64.37

MEAN / ug m ⁻³	61.84	123.17	60.83	64.78	64.28	62.54
STDEV / ug m ⁻³	0.35	0.97	0.56	1.29	1.82	2.12

Drift / %	1.97	2.03	2.05	1.98	1.78	1.63
Drift Uncertainty / ug m ⁻³	0.35	0.71	0.35	0.36	0.33	0.29

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 25: Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Beginning of drift period.						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered Conc / $\mu\text{g m}^{-3}$	44.60	51.99	60.86	121.23	59.90	
$\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
08/04/2010 11:26	0.41	1.03	0.00	0.70	0.00	
08/04/2010 11:56	46.05	51.99	57.13	112.83	54.41	
08/04/2010 12:56	45.76	50.44	55.81	110.96	54.79	
08/04/2010 13:26	45.18	52.48	61.03	121.81	60.29	
08/04/2010 13:56	45.86	50.84	56.93	113.49	55.67	
08/04/2010 14:26	44.60	51.99	60.86	121.23	59.90	
MEAN / $\mu\text{g m}^{-3}$	45.35	51.44	58.66	116.87	57.66	
STDEV / $\mu\text{g m}^{-3}$	0.58	0.96	2.68	5.47	2.84	

COMMERCIAL IN CONFIDENCE

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). End of drift period.						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered Conc / ug m ⁻³	45.18	52.67	61.66	122.82	60.69	
ug m ⁻³						
08/04/2010 11:26	2.04	10.80	1.58	5.93	2.06	
08/04/2010 11:56	43.59	50.08	57.53	114.10	56.29	
08/04/2010 12:56	45.63	53.14	61.71	122.74	60.86	
08/04/2010 13:26	43.82	51.38	59.73	119.25	59.20	
08/04/2010 13:56	46.18	53.92	62.76	125.17	62.13	
08/04/2010 14:26	44.01	51.43	59.87	119.95	59.15	
MEAN / ug m ³	44.91	52.47	61.02	121.78	60.33	
STDEV / ug m ⁻³	1.17	1.27	1.47	2.72	1.44	
Drift / %	0.96	2.01	4.02	4.20	4.63	
Drift Uncertainty / ug m ⁻³	0.13	0.30	0.68	1.42	0.77	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 26: Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic Model A73022, serial number 20720509, carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene. Beginning of drift period.					
Delivered Conc / $\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	44.60	51.99	60.86	121.23	59.90
$\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	0.38	0.93	0.00	0.59	0.00
	44.90	50.19	55.48	108.84	52.39
	45.10	49.70	55.61	109.98	53.87
	45.33	52.04	60.51	120.25	59.81
	45.23	50.91	58.10	115.41	56.83
08/04/2010 14:26	44.60	51.99	60.86	121.23	59.90
MEAN / $\mu\text{g m}^{-3}$	45.06	51.16	58.77	116.72	57.60
STDEV / $\mu\text{g m}^{-3}$	0.33	1.10	2.43	5.16	2.87

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). End of drift period.				
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES
Delivered Conc / $\mu\text{g m}^{-3}$	45.18	52.67	61.66	122.82
				O-XYLENE
				60.69
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES
				O-XYLENE
$\mu\text{g m}^{-3}$				
08/04/2010 11:26	1.92	9.88	1.38	4.91
08/04/2010 11:56	43.77	49.70	56.27	110.97
08/04/2010 12:56	45.45	52.57	60.85	120.70
08/04/2010 13:26	45.15	51.87	60.40	119.81
08/04/2010 13:56	46.41	53.55	62.33	123.96
08/04/2010 14:26	44.66	51.94	60.58	120.60
				59.22
MEAN / $\mu\text{g m}^{-3}$	45.42	52.48	61.04	121.27
STDEV / $\mu\text{g m}^{-3}$	0.74	0.78	0.88	1.84
				1.28
Drift / %	0.79	2.58	3.86	3.90
Drift Uncertainty / $\mu\text{g m}^{-3}$	0.10	0.38	0.65	1.31
				3.41
				0.57

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.2.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.3 Dependence on sample gas pressure (B3)

5.3.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Sensitivity coefficient for the influence of ambient pressure at the span concentration value (between 70 % and 90 % of the certification range) of benzene,

$$B_p < \pm 1\% \text{ kPa}^{-1}$$

However, when the criteria is expressed as a percentage then the test value shall be calculated from $100u/C$, where u is the uncertainty component in $\mu\text{g m}^{-3}$, and C is the highest concentration used in the test. **In this case the standard stipulates that the test shall be carried out at the limit value.**

5.3.2 Additional requirements

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.3.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs, pressure controller, pump, pressure sensor.

5.3.4 Testing

This was carried out at the limit value of benzene, namely $5\mu\text{g m}^{-3}$ (1.54 ppb). All other determinands involved in the test were present at known concentrations of nominally 1.54 ppb.

A total of 5 **valid** determinand sample injections were carried out at the limit value for each pressure. The first sample result was rejected in each case.

The test shall be carried out at a pressure of **80 kPa (600 torr)**, and again at **110 kPa (825 torr)**. The CAMs sampled ambient air before and after the test.

5.3.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

5.3.6 Results

The partial standard uncertainty due to pressure changes u_p was estimated from:

$$u_p = \frac{b_p \cdot |\Delta P|}{2\sqrt{3}}$$

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

where the sensitivity coefficient b_p ($(\mu\text{g m}^{-3})/\text{kPa}$) is given by:

$$b_p = \frac{|c_{p_{\max}} - c_{p_{\min}}|}{|\Delta P|}$$

$c_{p_{\max}}$ is the average of the individual measurements at maximum sampling gas pressure $P_{\max}$ at the limit value concentration ;

$c_{p_{\min}}$ is the average of the individual measurements at minimum sampling gas pressure $P_{\min}$ at the limit value concentration

$$\Delta P = P_{\max} - P_{\min}$$

In the present standard, the performance criterion is expressed as a percentage, then the test value shall be calculated from $100u/C$, where u is the uncertainty component in $\mu\text{g m}^{-3}$, and C is the highest concentration used in the test.

The standard is currently being reviewed, since in certain tests, the performance criteria are ambiguous.

Certain “accredited” laboratories have made the interpretation defining the performance criterion, K as:

$$K = \frac{u_p \cdot 100}{C \cdot \Delta P}$$

where C is the highest concentration used in the test. For comparison with existing test reports a similar interpretation has been employed where C in this case is the limit concentration. This is the test criterion. It is important to note that the test is required to be carried at the limit value, but that the performance criterion is defined with respect to the span value.

An alternative interpretation is included here based on the sensitivity coefficient since this is a quantity also defined in the standard.

The sensitivity coefficient expressed as a percentage is given by:

$$b_p = \frac{|c_{p_{\max}} - c_{p_{\min}}|}{c_{p_{\max}}} \cdot \frac{100\%}{\Delta P}$$

Tables 27, 28, 29 and 30 summarise the results for the sample gas pressure test for all four CAMs at the limit concentration.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 27: Dependence on sample pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 80kPa.							
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
Delivered Conc / $\mu\text{g m}^{-3}$	5.50	5.01	7.33	6.31	5.84	7.26	
$\mu\text{g m}^{-3}$							
20/06/2011 14:09	4.42	4.23	5.75	4.97	5.10	5.74	
20/06/2011 14:39	4.39	4.01	5.77	4.89	5.10	5.71	
20/06/2011 15:09	Not Recognised	4.54	5.76	4.94	5.29	5.69	
20/06/2011 15:39	Not Recognised	4.39	5.65	4.98	5.29	5.64	
20/06/2011 16:09	4.33	4.50	5.69	4.91	5.49	5.65	
20/06/2011 16:39	Not Recognised	Not Recognised	5.76	4.87	5.02	5.63	
MEAN / $\mu\text{g m}^{-3}$	4.33	4.48	5.72	4.93	5.28	5.65	
STDEV / $\mu\text{g m}^{-3}$	N/A	0.07	0.05	0.05	0.19	0.03	
Mean Pressure / kPa	80.12						

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 110kPa.								
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
Delivered Conc / $\mu\text{g m}^{-3}$	5.50	5.01	7.33	6.31	5.84	7.26		
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
21/06/2011 14:09	5.51	4.98	7.30	6.31	6.01	7.31		
21/06/2011 14:39	5.52	5.00	7.26	6.20	6.03	7.12		
21/06/2011 15:09	5.59	4.95	7.35	6.17	5.95	7.19		
21/06/2011 15:39	5.49	5.02	7.32	6.20	6.11	7.30		
21/06/2011 16:09	5.52	4.97	7.29	6.24	5.79	7.22		
21/06/2011 16:39	5.50	5.01	7.33	6.31	5.84	7.26		
MEAN / $\mu\text{g m}^{-3}$	5.52	4.99	7.32	6.23	5.92	7.24		
STDEV / $\mu\text{g m}^{-3}$	0.05	0.04	0.02	0.06	0.14	0.05		
Sensitivity Coefficient b_p ($\mu\text{g m}^{-3} \text{ kPa}^{-1}$)	0.040	0.017	0.053	0.043	0.021	0.053		
Std Uncertainty u_p ($\mu\text{g m}^{-3}$)	0.34	0.15	0.46	0.38	0.19	0.46		
Performance Criteria K (% kPa^{-1})	0.21	0.10	0.21	0.20	0.11	0.21		
Sensitivity Coefficient (% kPa^{-1})	0.72	0.34	0.73	0.68	0.37	0.73		
Mean Pressure / kPa	110.32							

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 27 (continued): Dependence on sample pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 80kPa.									
Delivered Conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	Delivered Conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES
	6.83	13.62	6.74	7.27	7.29	7.10			
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
20/06/2011 14:09	5.65	11.64	5.41	6.79	6.09	7.73			
20/06/2011 14:39	5.55	11.25	5.26	6.53	5.98	7.48			
20/06/2011 15:09	5.39	10.50	5.26	5.80	5.89	7.65			
20/06/2011 15:39	5.46	11.27	5.59	6.12	5.80	7.64			
20/06/2011 16:09	5.52	11.26	5.28	5.63	5.73	7.58			
20/06/2011 16:39	5.50	11.12	5.29	5.58	5.79	7.62			
MEAN / $\mu\text{g m}^{-3}$	5.47	11.04	5.36	5.78	5.80	7.62			
STDEV / $\mu\text{g m}^{-3}$	0.06	0.36	0.16	0.25	0.06	0.03			
Mean Pressure / kPa	80.12								

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 110kPa.						
Delivered Conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
	6.83	13.62	6.74	7.27	7.29	7.10
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
	21/06/2011 14:09	6.63	13.27	6.50	5.87	6.30
	21/06/2011 14:39	6.81	13.56	6.62	7.05	6.80
	21/06/2011 15:09	6.82	13.88	6.77	7.21	7.02
	21/06/2011 15:39	6.83	13.99	6.67	7.26	7.06
	21/06/2011 16:09	6.82	13.70	6.68	7.27	7.07
	21/06/2011 16:39	6.83	13.62	6.74	7.29	7.10
MEAN / $\mu\text{g m}^{-3}$	6.83	13.80	6.71	7.16	7.26	7.06
STDEV / $\mu\text{g m}^{-3}$	0.00	0.17	0.05	0.08	0.03	0.03
Sensitivity Coefficient b_p ($\mu\text{g m}^{-3} \text{ kPa}^{-1}$)	0.045	0.091	0.045	0.046	0.048	0.019
Std Uncertainty u_p ($\mu\text{g m}^{-3}$)	0.39	0.80	0.39	0.40	0.42	0.16
Performance Criteria K (% kPa^{-1})	0.19	0.19	0.19	0.18	0.19	0.08
Sensitivity Coefficient (% kPa^{-1})	0.66	0.67	0.67	0.63	0.66	0.26
Mean Pressure / kPa	110.32					

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 28: Dependence on sample pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 80kPa.							
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
Delivered Conc / $\mu\text{g m}^{-3}$	5.50	5.01	7.33	6.31	5.84	7.26	
$\mu\text{g m}^{-3}$							
20/06/2011 14:08	Not Recognised	4.05	5.88	4.96	5.05	5.78	
20/06/2011 14:38	Not Recognised	4.07	5.82	5.00	5.03	5.73	
20/06/2011 15:08	Not Recognised	4.05	5.82	0.00	5.14	5.69	
20/06/2011 15:38	Not Recognised	4.10	5.83	4.95	5.30	5.70	
20/06/2011 16:08	Not Recognised	4.07	5.86	4.91	5.39	5.71	
20/06/2011 16:38	Not Recognised	4.05	Not Recognised	Not Recognised	5.14	5.61	
MEAN / $\mu\text{g m}^{-3}$	N/A	4.07	5.83	3.29	5.24	5.68	
STDEV / $\mu\text{g m}^{-3}$	N/A	0.03	0.02	2.85	0.13	0.04	
Mean Pressure / kPa	80.12						

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 110kPa.						
Delivered Conc / $\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	5.50	5.01	7.33	6.31	5.84	7.26
$\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
21/06/2011 14:08	5.50	5.04	7.36	6.36	5.92	7.31
21/06/2011 14:38	5.51	5.04	7.38	6.35	5.93	7.30
21/06/2011 15:08	5.56	5.07	7.41	6.37	5.94	7.28
21/06/2011 15:38	5.48	5.04	7.37	6.37	5.87	7.31
21/06/2011 16:08	5.48	5.00	7.35	6.35	5.86	7.20
21/06/2011 16:38	5.50	5.01	7.33	6.31	5.84	7.26
MEAN / $\mu\text{g m}^{-3}$	5.51	5.03	7.37	6.35	5.88	5.88
STDEV / $\mu\text{g m}^{-3}$	0.04	0.03	0.03	0.03	0.04	0.05
Sensitivity Coefficient b_p ($\mu\text{g m}^{-3} \text{ kPa}^{-1}$)	N/A	0.032	0.051	0.101	0.021	0.052
Std Uncertainty u_p ($\mu\text{g m}^{-3}$)	N/A	0.28	0.44	0.88	0.18	0.46
Performance Criteria K (% kPa^{-1})	N/A	0.18	0.20	0.46	0.10	0.21
Sensitivity Coefficient (% kPa^{-1})	N/A	0.64	0.69	1.61	0.36	0.72
Mean Pressure / kPa	110.32					

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 28 (continued): Dependence on sample pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 80kPa.						
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
Delivered Conc / $\mu\text{g m}^{-3}$	6.83	13.62	6.74	7.27	7.29	7.10
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
20/06/2011 14:08	5.67	11.30	5.86	6.91	6.35	Not Recognised
20/06/2011 14:38	5.56	11.04	5.68	6.56	5.70	7.67
20/06/2011 15:08	5.52	10.92	5.61	5.94	5.43	6.82
20/06/2011 15:38	5.54	10.96	5.61	6.42	6.03	6.78
20/06/2011 16:08	5.47	10.83	5.50	5.75	5.06	6.61
20/06/2011 16:38	5.52	10.84	5.55	5.80	5.14	6.69
MEAN / $\mu\text{g m}^{-3}$	5.51	10.89	5.57	5.98	5.41	6.72
STDEV / $\mu\text{g m}^{-3}$	0.03	0.06	0.05	0.31	0.44	0.09
Mean Pressure / kPa	80.12					

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Dependence on sample gas pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 110kPa.							
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	
Delivered Conc / $\mu\text{g m}^{-3}$	6.83	13.62	6.74	7.27	7.29	7.10	
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	
$\mu\text{g m}^{-3}$							
21/06/2011 14:08	6.70	13.06	6.62	6.49	5.48	6.63	
21/06/2011 14:38	6.77	13.26	6.72	7.27	7.86	7.86	
21/06/2011 15:08	6.80	13.36	6.73	6.80	7.09	Not Recognised	
21/06/2011 15:38	6.82	13.40	6.73	7.48	7.36	7.36	
21/06/2011 16:08	6.80	13.38	6.75	7.46	7.66	7.16	
21/06/2011 16:38	6.83	13.62	6.74	7.27	7.29	7.10	
MEAN / $\mu\text{g m}^{-3}$	6.81	13.44	6.74	7.25	7.35	7.21	
STDEV / $\mu\text{g m}^{-3}$	0.01	0.12	0.01	0.32	0.24	0.13	
Sensitivity Coefficient b_p ($\mu\text{g m}^{-3} \text{ kPa}^{-1}$)	0.043	0.084	0.039	0.042	0.064	0.016	
Std Uncertainty u_p ($\mu\text{g m}^{-3}$)	0.37	0.74	0.34	0.37	0.56	0.14	
Performance Criteria K (% kPa^{-1})	0.18	0.18	0.17	0.17	0.25	0.07	
Sensitivity Coefficient (% kPa^{-1})	0.63	0.62	0.58	0.58	0.88	0.23	
Mean Pressure / kPa	110.32						

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 29: Dependence on sample pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Dependence on sample gas pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 80kPa.						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered Conc / $\mu\text{g m}^{-3}$	5.01	5.84	6.83	13.62	6.74	
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
20/06/2011 14:09	3.50	4.01	3.76	7.98	4.03	
20/06/2011 14:39	3.73	4.43	4.02	8.50	4.29	
20/06/2011 15:09	3.57	4.21	3.79	7.95	3.99	
20/06/2011 15:39	3.80	4.57	4.02	8.49	4.26	
20/06/2011 16:09	3.44	4.39	3.76	7.87	4.01	
20/06/2011 16:39	Not Recognised	Not Recognised	Not Recognised	Not Recognised	Not Recognised	
MEAN / $\mu\text{g m}^{-3}$	3.60	4.39	3.86	8.10	4.09	
STDEV / $\mu\text{g m}^{-3}$	0.18	0.18	0.14	0.33	0.15	
Mean Pressure / kPa	80.12					

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Dependence on sample gas pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 110kPa.					
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Delivered Conc / $\mu\text{g m}^{-3}$	5.01	5.84	6.83	13.62	6.74
$\mu\text{g m}^{-3}$	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
21/06/2011 14:09	4.78	4.83	5.01	9.91	4.90
21/06/2011 14:39	4.93	4.99	5.20	10.23	4.96
21/06/2011 15:09	4.93	4.84	5.08	9.96	4.98
21/06/2011 15:39	4.97	5.02	5.11	10.08	4.93
21/06/2011 16:09	4.91	4.88	5.17	10.25	5.08
21/06/2011 16:39	5.01	4.95	5.02	10.02	4.96
MEAN / $\mu\text{g m}^{-3}$	4.95	4.92	5.10	10.08	4.99
STDEV / $\mu\text{g m}^{-3}$	0.04	0.08	0.06	0.13	0.06
Sensitivity Coefficient b_p ($\mu\text{g m}^{-3} \text{ kPa}^{-1}$)	0.045	0.018	0.041	0.065	0.030
Std Uncertainty u_p ($\mu\text{g m}^{-3}$)	0.39	0.15	0.36	0.57	0.26
Performance Criteria K (% kPa^{-1})	0.26	0.10	0.24	0.19	0.17
Sensitivity Coefficient (% kPa^{-1})	0.89	0.36	0.82	0.65	0.60
Mean Pressure / kPa	110.32				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 30: Dependence on sample pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Dependence on sample gas pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 80kPa.						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered Conc / $\mu\text{g m}^{-3}$	5.01	5.84	6.83	13.62	6.74	
$\mu\text{g m}^{-3}$						
20/06/2011 14:09	4.21	4.61	4.19	8.93	4.57	
20/06/2011 14:39	4.28	4.88	4.29	9.12	4.65	
20/06/2011 15:09	4.20	4.84	4.16	8.86	4.52	
20/06/2011 15:39	4.28	5.08	4.27	9.09	4.66	
20/06/2011 16:09	4.18	5.03	4.13	8.77	4.48	
20/06/2011 16:39	4.18	4.72	4.09	8.65	4.39	
MEAN / $\mu\text{g m}^{-3}$	4.21	4.92	4.16	8.84	4.51	
STDEV / $\mu\text{g m}^{-3}$	0.05	0.17	0.08	0.19	0.11	
Mean Pressure / kPa	80.12					

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Dependence on sample gas pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Results at 110kPa.						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered Conc / $\mu\text{g m}^{-3}$	5.01	5.84	6.83	13.62	6.74	
$\mu\text{g m}^{-3}$						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
21/06/2011 14:09	4.97	4.90	5.00	10.03	4.93	
21/06/2011 14:39	5.02	4.99	5.08	10.09	5.00	
21/06/2011 15:09	4.98	4.91	5.10	10.17	5.07	
21/06/2011 15:39	5.06	5.02	5.09	10.19	5.04	
21/06/2011 16:09	4.98	4.92	5.14	10.35	5.10	
21/06/2011 16:39	5.01	4.95	5.02	10.02	4.96	
MEAN / $\mu\text{g m}^{-3}$	5.01	4.95	5.09	10.18	5.04	
STDEV / $\mu\text{g m}^{-3}$	0.04	0.05	0.05	0.13	0.06	
Sensitivity Coefficient bp ($\mu\text{g m}^{-3} \text{ kPa}^{-1}$)	0.026	0.001	0.031	0.044	0.018	
Std Uncertainty up ($\mu\text{g m}^{-3}$)	0.23	0.01	0.27	0.39	0.15	
Performance Criteria K (% kPa^{-1})	0.15	0.01	0.18	0.13	0.10	
Sensitivity Coefficient (% kPa^{-1})	0.53	0.02	0.61	0.44	0.36	
Mean Pressure / kPa	110.32					

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.3.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

No value for n-hexane.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.4 Lack of fit (linearity) (B4)

5.4.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Largest residual, $X_l < 5\%$ of the value of the input concentration

5.4.2 Additional requirements

The performance criterion for the zero point shall be less than 5 % of the limit value for benzene, namely $< \pm 0.25 \mu\text{g m}^{-3}$.

The additional criteria, which are not a part of the performance criteria, were not applied.

Depending on the results of the repeatability tests the number of valid samples may be reduced from seven to five for each concentration.

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.4.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs.

5.4.4 Testing

This test was carried out at the following concentrations: 0 (below the detection limit), 5 ($\pm 10\%$), 15 ($\pm 10\%$), 25 ($\pm 10\%$), 35 ($\pm 10\%$), 45 ($\pm 10\%$) $\mu\text{g m}^{-3}$, which is equivalent to 0, 1.54, 4.62, 7.70, 10.8, 13.9 ppb for benzene.

All other determinands involved in the test contained a **known** nominal concentration of 0, 1.54, 4.62, 7.70, 10.8, 13.9 ppb. A total of 7 valid determinand sample injections were required for each concentration. The first **valid** sample result was rejected in each case, leaving six measurements at each concentration.

The CAMs sampled ambient air before but **not** after this test, **until** the **Carry-over (memory effect) (B5)** had been completed.

5.4.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.4.6 Results

A linear regression function was determined from the responses of the analyser and the corresponding applied concentration levels. The residual at each concentration level is equal to the difference between the average response measured, expressed as a concentration, and the concentration given by the linear regression function.

The calibration function for the analyser was evaluated from the linearity test. At each concentration (including zero) at least 6 independent measurements were performed.

The residual from the linear regression function was determined for each concentration step. Each residual was expressed relative to the individual known input concentration, $(d_r)_c$.

The largest value of $(d_r)_c$ was reported as X_{fit} and was included in the uncertainty calculation.

The standard uncertainty due to lack of fit at the limit value, $u_{fit,LV}$ is calculated according to:

$$u_{fit,LV} = ((X_{fit} / 100) \times c_{LV}) / \sqrt{3}$$

where

$u_{fit,LV}$ is the standard uncertainty due to the lack of fit at the reference value;

$X_{fit,LV}$ is the calculated residual from the linear regression function at the limit value (%)

c_{LV} is the limit value.

Tables 21 – 54 gives the results for the lack of fit tests for all four CAMs at each concentration required.

Figures 25 – 58 show the linear regression fit for each species and each of the four CAMs.

Tables 54, 55, 56 and 57 summarise the results for the lack of fit tests for all four CAMs.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 31: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	ug m^{-3}	04/05/2010 09:28	0.00
	0.00	0.00	0.00	0.00	0.00	0.00			
ug m^{-3}	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		04/05/2010 09:58	0.00
	0.00	0.22	0.00	0.00	0.17	0.00		04/05/2010 10:28	0.00
	0.00	0.00	0.00	0.00	0.00	0.00		04/05/2010 10:58	0.00
	0.00	0.00	0.00	0.00	0.00	0.00		04/05/2010 11:28	0.00
	0.00	0.00	0.00	0.00	0.00	0.00		04/05/2010 11:58	0.00
	0.00	0.00	0.00	0.00	0.00	0.00		04/05/2010 12:28	0.00
	0.00	0.00	0.00	0.00	0.00	0.00		04/05/2010 12:58	0.00
	0.00	0.00	0.00	0.00	0.00	0.00		MEAN / $\mu\text{g m}^{-3}$	0.00
STDEV / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00	0.00		STDEV / $\mu\text{g m}^{-3}$	0.00
	0.00	0.00	0.00	0.00	0.00	0.00			0.00

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 31 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).							
Delivered conc / ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	
	0.00	0.00	0.00	0.00	0.00	0.00	
ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	
04/05/2010 09:28	0.00	0.00	0.00	0.00	0.29	0.00	0.00
04/05/2010 09:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/05/2010 10:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/05/2010 10:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/05/2010 11:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/05/2010 11:58	0.00	0.00	1.94	0.00	0.00	0.00	0.00
04/05/2010 12:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/05/2010 12:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN / ug m ⁻³	0.00	0.00	0.32	0.00	0.00	0.00	0.00
STDEV / ug m ⁻³	0.00	0.00	0.79	0.00	0.00	0.00	0.00

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 32: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 5 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
Delivered conc / $\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	5.39	4.90	7.17	6.17	5.72	7.12
$\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
05/05/2010 10:46	5.16	4.34	6.69	5.58	4.61	6.11
05/05/2010 11:16	5.02	4.26	6.57	5.65	4.87	6.08
05/05/2010 11:46	5.12	4.22	7.11	5.65	4.71	6.39
05/05/2010 12:16	6.16	3.98	6.57	5.59	4.89	6.15
05/05/2010 12:46	5.30	4.29	6.75	5.53	4.69	6.26
05/05/2010 13:16	4.99	4.30	6.20	5.60	4.81	6.41
05/05/2010 13:46	4.92	4.33	6.56	5.62	4.85	6.29
05/05/2010 14:16	4.94	4.36	6.75	5.45	4.93	6.38
MEAN / $\mu\text{g m}^{-3}$	5.24	4.25	6.66	5.57	4.81	6.31
STDEV / $\mu\text{g m}^{-3}$	0.47	0.14	0.30	0.07	0.10	0.10

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 32 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of $5 \mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	6.69	13.33	6.59	7.10	7.13	6.95			
ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	05/05/2010 10:46	6.04	11.25	5.73	5.66	5.59	5.78		
	05/05/2010 11:16	6.18	11.50	6.03	6.44	5.91	6.20		
	05/05/2010 11:46	6.25	11.87	5.96	6.65	6.59	6.27		
	05/05/2010 12:16	6.32	11.82	5.89	6.13	6.81	6.37		
	05/05/2010 12:46	6.12	11.03	5.55	6.15	6.15	6.48		
	05/05/2010 13:16	6.23	11.29	6.03	6.12	6.17	6.41		
	05/05/2010 13:46	6.36	11.82	6.09	6.71	6.68	6.63		
05/05/2010 14:16	6.30	12.13	6.03	6.73	6.92	6.52			
MEAN / ug m ⁻³	6.26	11.66	5.93	6.41	6.55	6.45			
STDEV / ug m ⁻³	0.08	0.41	0.20	0.31	0.32	0.13			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 33: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
Delivered conc / $\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	16.46	14.98	21.90	18.84	17.46	21.73
$\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
05/05/2010 10:46	13.37	12.06	18.12	15.26	12.74	16.91
05/05/2010 11:16	15.70	13.86	20.75	17.80	16.52	20.04
05/05/2010 11:46	15.49	14.62	21.01	17.76	16.48	20.23
05/05/2010 12:16	15.95	13.62	21.00	17.89	16.10	20.25
05/05/2010 12:46	15.92	14.79	20.95	17.63	16.21	20.19
05/05/2010 13:16	15.82	13.51	20.85	17.79	16.25	20.38
05/05/2010 13:46	15.90	13.49	21.12	17.80	16.54	20.35
05/05/2010 14:16	15.78	13.56	21.32	17.32	15.35	20.03
MEAN / $\mu\text{g m}^{-3}$	15.81	13.93	21.04	17.70	16.16	20.24
STDEV / $\mu\text{g m}^{-3}$	0.17	0.60	0.16	0.20	0.43	0.12

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 33 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	20.44	40.71	20.12	21.68	21.77	21.23			
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
05/05/2010 10:46	15.88	30.16	14.83	15.92	15.85	15.04			
05/05/2010 11:16	19.26	36.92	18.13	20.00	19.87	18.95			
05/05/2010 11:46	19.64	37.79	18.40	20.59	20.59	19.68			
05/05/2010 12:16	19.58	37.67	18.60	20.87	20.76	20.10			
05/05/2010 12:46	19.59	37.84	18.58	20.91	20.90	20.22			
05/05/2010 13:16	19.57	37.78	18.51	20.91	21.05	20.38			
05/05/2010 13:46	19.61	37.75	18.64	20.98	21.09	20.47			
05/05/2010 14:16	19.66	37.92	18.58	19.98	21.15	20.50			
MEAN / $\mu\text{g m}^{-3}$	19.61	37.79	18.55	20.71	20.92	20.22			
STDEV / $\mu\text{g m}^{-3}$	0.04	0.08	0.08	0.38	0.22	0.31			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 34: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 µg m⁻³.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Delivered conc / ug m ⁻³	27.35	24.88	36.39	31.30	29.01	36.11
ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
06/05/2010 10:16	26.24	23.79	35.03	29.24	26.83	33.41
06/05/2010 10:46	26.04	23.71	35.16	28.26	27.55	33.66
06/05/2010 11:16	26.19	23.43	35.22	29.91	26.59	33.28
06/05/2010 11:46	26.30	23.88	35.14	29.66	27.50	34.03
06/05/2010 12:16	26.30	23.82	34.94	29.75	27.44	33.78
06/05/2010 12:46	26.40	23.94	35.11	29.37	26.56	33.54
06/05/2010 13:16	26.26	23.88	35.26	30.10	27.53	33.81
06/05/2010 13:46	26.54	23.81	35.27	29.98	27.09	33.62
MEAN / ug m ⁻³	26.33	23.80	35.16	29.79	27.12	33.68
STDEV / ug m ⁻³	0.12	0.19	0.12	0.26	0.45	0.26

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 34 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	33.96	67.64	33.42	36.03	36.18	35.28			
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	06/05/2010 10:16	30.72	58.76	28.54	30.09	29.21	27.33		
	06/05/2010 10:46	31.93	61.54	30.03	32.89	32.38	31.20		
	06/05/2010 11:16	32.15	62.14	30.37	33.67	33.42	32.33		
	06/05/2010 11:46	32.62	64.77	32.08	34.06	34.07	32.81		
	06/05/2010 12:16	32.44	62.60	30.75	34.52	34.64	33.45		
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	06/05/2010 12:46	32.80	65.12	32.21	34.63	34.83	33.48		
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	06/05/2010 13:16	32.76	65.05	32.29	34.70	34.89	33.84		
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	06/05/2010 13:46	32.84	65.37	32.22	34.85	34.97	33.92		
MEAN / $\mu\text{g m}^{-3}$	32.60	64.17	31.65	34.40	34.47	33.30			
STDEV / $\mu\text{g m}^{-3}$	0.27	1.42	0.86	0.45	0.61	0.62			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 35: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Delivered conc / $\mu\text{g m}^{-3}$	38.32	34.87	50.99	43.85	40.64	50.59
$\mu\text{g m}^{-3}$						
06/05/2010 15:16	37.41	33.22	50.10	41.63	38.62	47.42
06/05/2010 15:46	37.18	32.79	50.20	42.81	39.12	48.47
06/05/2010 16:16	38.08	33.27	50.14	42.40	39.37	49.39
06/05/2010 16:46	37.39	33.95	49.92	42.64	39.40	48.68
06/05/2010 17:16	37.18	34.25	50.20	42.05	38.64	48.27
06/05/2010 17:46	37.40	33.26	49.88	42.35	39.21	48.01
06/05/2010 18:16	37.48	34.00	49.97	42.56	39.31	48.49
06/05/2010 18:46	37.54	33.11	49.98	41.19	39.25	48.71
MEAN / $\mu\text{g m}^{-3}$	37.51	33.64	50.02	42.20	39.20	48.59
STDEV / $\mu\text{g m}^{-3}$	0.31	0.48	0.13	0.54	0.28	0.47

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 35 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	47.58	94.78	46.83	50.48	50.69	49.43			
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
06/05/2010 15:16	44.96	88.85	43.73	45.79	45.40	43.74			
06/05/2010 15:46	46.27	91.98	45.49	48.39	48.37	46.56			
06/05/2010 16:16	46.63	92.83	45.86	48.79	49.21	47.64			
06/05/2010 16:46	46.51	92.78	45.84	49.10	49.50	47.94			
06/05/2010 17:16	46.48	92.55	45.71	49.35	49.58	48.27			
06/05/2010 17:46	46.53	92.81	45.85	49.48	49.67	48.35			
06/05/2010 18:16	46.43	92.58	45.79	49.37	49.67	48.38			
06/05/2010 18:46	46.44	92.75	45.75	49.71	49.91	48.50			
MEAN / $\mu\text{g m}^{-3}$	46.50	92.71	45.80	49.30	49.59	48.18			
STDEV / $\mu\text{g m}^{-3}$	0.07	0.12	0.06	0.32	0.23	0.32			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 36: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 µg m⁻³.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
Delivered Span Conc / µg m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	48.61	44.23	64.68	55.63	51.56	64.17
µg m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
07/05/2010 09:46	49.05	43.92	65.16	55.59	51.20	61.23
07/05/2010 10:16	48.73	44.02	65.05	55.61	50.72	62.08
07/05/2010 10:46	48.65	43.19	64.50	54.82	51.48	64.20
07/05/2010 11:16	49.13	43.74	64.48	55.37	51.04	64.21
07/05/2010 11:46	49.11	44.61	65.04	56.42	51.95	63.14
07/05/2010 12:16	48.67	43.95	65.00	54.65	51.35	64.09
07/05/2010 12:46	48.80	44.40	64.86	55.80	51.58	63.21
07/05/2010 13:16	48.61	44.23	64.68	55.63	51.56	64.17
MEAN / µg m ⁻³	48.83	44.02	64.76	55.45	51.50	63.84
STDEV / µg m ⁻³	0.23	0.51	0.25	0.65	0.30	0.51

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 36 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered Span Conc / $\mu\text{g m}^{-3}$		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
		60.35	120.22	59.41	64.04	64.31	62.70		
$\mu\text{g m}^{-3}$		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
07/05/2010 09:46		58.07	114.49	56.03	56.15	54.37	51.03		
07/05/2010 10:16		59.54	118.26	58.18	60.86	60.38	57.35		
07/05/2010 10:46		60.10	119.72	58.94	62.92	62.51	59.93		
07/05/2010 11:16		60.29	120.23	59.16	63.30	63.22	61.06		
07/05/2010 11:46		60.31	120.32	59.40	63.58	63.46	61.70		
07/05/2010 12:16		60.32	120.41	59.52	63.61	64.16	61.60		
07/05/2010 12:46		60.34	120.32	59.35	64.06	64.05	62.33		
07/05/2010 13:16		60.35	120.22	59.41	64.04	64.31	62.70		
MEAN / $\mu\text{g m}^{-3}$		60.29	120.21	59.30	63.59	63.62	61.55		
STDEV / $\mu\text{g m}^{-3}$		0.09	0.25	0.21	0.44	0.69	0.98		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 37: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	ug m^{-3}	04/05/2010 09:28	N-HEXANE
	0.00	0.00	0.00	0.00	0.00	0.00			N-OCTANE
04/05/2010 09:28	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	04/05/2010 09:58	04/05/2010 10:28	N-HEXANE
	0.00	0.22	0.00	0.00	0.14	0.00			N-OCTANE
	0.00	0.00	0.00	0.00	0.00	0.00			N-OCTANE
	0.00	0.00	0.00	0.00	0.00	0.00			N-OCTANE
	0.00	0.00	0.00	0.00	0.00	0.00			N-OCTANE
	0.00	0.00	0.00	0.00	0.00	0.00			N-OCTANE
	0.00	0.00	0.00	0.00	0.00	0.00			N-OCTANE
	0.00	0.00	0.00	0.00	0.00	0.00			N-OCTANE
MEAN / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00	0.00	STDEV / $\mu\text{g m}^{-3}$	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00			0.00

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 37 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of $0 \mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	0.00	0.00	0.00	0.00	0.00	0.00			
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
04/05/2010 09:28	0.00	0.00	0.00	0.00	0.14	0.21			
04/05/2010 09:58	0.00	0.00	0.00	0.00	0.00	0.18			
04/05/2010 10:28	0.00	0.00	0.00	0.00	0.00	0.15			
04/05/2010 10:58	0.00	0.00	0.00	0.00	0.00	0.13			
04/05/2010 11:28	0.00	0.00	0.00	0.00	0.00	0.00			
04/05/2010 11:58	0.00	0.00	0.00	0.00	0.00	0.00			
04/05/2010 12:28	0.00	0.00	0.00	0.00	0.00	0.00			
04/05/2010 12:58	0.00	0.00	0.00	0.00	0.00	0.00			
MEAN / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00	0.05			
STDEV / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00	0.07			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 38: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 5 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
Delivered conc / $\mu\text{g m}^{-3}$	5.39	4.90	7.17	6.17	5.72	7.12			
$\mu\text{g m}^{-3}$									
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
05/05/2010 10:46	5.18	4.42	6.74	5.71	5.22	6.60			
05/05/2010 11:16	5.12	4.43	6.70	5.63	5.02	6.67			
05/05/2010 11:46	5.15	4.40	6.68	5.67	5.16	6.72			
05/05/2010 12:16	5.14	4.42	6.75	5.66	5.04	6.77			
05/05/2010 12:46	5.15	4.46	6.75	5.69	5.04	6.76			
05/05/2010 13:16	5.12	4.46	6.70	5.56	5.16	6.67			
05/05/2010 13:46	5.15	4.42	6.72	5.63	4.96	6.70			
05/05/2010 14:16	5.12	4.45	6.69	5.53	4.97	6.71			
MEAN / $\mu\text{g m}^{-3}$	5.14	4.44	6.71	5.62	5.06	6.72			
STDEV / $\mu\text{g m}^{-3}$	0.01	0.02	0.03	0.07	0.09	0.04			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 38 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of $5 \mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	6.69	13.33	6.59	7.10	7.13	6.95			
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
05/05/2010 10:46	6.32	11.78	5.69	6.45	6.20	6.46			
05/05/2010 11:16	6.44	12.06	5.83	6.61	6.76	6.79			
05/05/2010 11:46	6.45	12.17	5.90	6.84	6.88	6.87			
05/05/2010 12:16	6.50	12.20	5.94	6.90	6.95	6.95			
05/05/2010 12:46	6.46	12.07	5.88	6.95	7.00	6.99			
05/05/2010 13:16	6.47	12.10	5.87	6.97	7.03	7.04			
05/05/2010 13:46	6.49	12.16	5.92	6.99	7.10	6.99			
05/05/2010 14:16	6.50	12.24	5.88	6.98	7.09	7.03			
MEAN / $\mu\text{g m}^{-3}$	6.48	12.16	5.90	6.94	7.01	6.98			
STDEV / $\mu\text{g m}^{-3}$	0.02	0.06	0.03	0.06	0.08	0.06			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 39: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
	16.46	14.98	21.90	18.84	17.46	21.73			
$\mu\text{g m}^{-3}$	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
	14.14	12.08	18.54	15.60	14.21	17.93			
	16.18	14.77	21.24	18.07	16.59	21.19			
	16.23	14.22	21.41	18.08	16.72	21.21			
	16.19	13.94	21.41	18.23	16.91	21.22			
	16.19	14.68	21.37	18.08	16.82	21.33			
	16.14	14.48	21.36	17.97	16.51	21.41			
	16.13	14.68	21.32	18.09	16.98	21.30			
	16.07	14.54	21.26	18.11	16.99	21.31			
MEAN / $\mu\text{g m}^{-3}$	16.16	14.42	21.35	18.09	16.82	21.30			
STDEV / $\mu\text{g m}^{-3}$	0.06	0.29	0.06	0.08	0.18	0.07			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 39 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	20.44	40.71	20.12	21.68	21.77	21.23			
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	05/05/2010 10:46	16.60	31.38	14.76	16.76	16.84	16.43	16.43	16.43
	05/05/2010 11:16	19.84	37.68	17.78	20.25	20.45	19.99	19.99	19.99
	05/05/2010 11:46	20.04	38.09	17.99	20.87	21.02	20.69	20.69	20.69
	05/05/2010 12:16	20.03	38.23	18.09	21.19	21.39	21.01	21.01	21.01
	05/05/2010 12:46	20.06	38.30	18.12	21.69	21.53	21.05	21.05	21.05
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	05/05/2010 13:16	20.07	38.33	18.09	21.40	21.64	20.88	20.88	20.88
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	05/05/2010 13:46	20.17	38.96	19.35	21.45	21.71	21.99	21.99	21.99
$\mu\text{g m}^{-3}$	ETHYLBENZENE								
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	124-TMB	123-TMB	123-TMB
	05/05/2010 14:16	20.03	38.25	18.10	21.27	21.73	21.31	21.31	21.31
MEAN / $\mu\text{g m}^{-3}$	20.07	38.36	18.29	21.31	21.50	21.15			
STDEV / $\mu\text{g m}^{-3}$	0.05	0.30	0.52	0.28	0.27	0.46			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 40: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 µg m⁻³.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).							
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
Delivered conc / µg m ⁻³	27.35	24.88	36.39	31.30	29.01	36.11	
ug m ⁻³							
06/05/2010 10:16	26.76	24.34	34.88	30.08	27.74	35.09	
06/05/2010 10:46	26.71	24.43	34.98	29.91	27.89	35.85	
06/05/2010 11:16	26.61	24.29	35.06	30.08	28.27	35.43	
06/05/2010 11:46	26.89	24.52	35.03	29.86	27.70	34.94	
06/05/2010 12:16	26.98	24.45	35.05	29.94	27.82	35.53	
06/05/2010 12:46	26.77	24.29	35.09	29.77	28.25	35.56	
06/05/2010 13:16	26.88	24.50	35.12	30.03	28.25	35.55	
06/05/2010 13:46	26.70	24.53	35.06	29.94	28.17	35.94	
MEAN / µg m ⁻³	26.81	24.43	35.07	29.94	28.08	35.49	
STDEV / µg m ⁻³	0.14	0.11	0.03	0.11	0.25	0.32	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 40 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	33.96	67.64	33.42	36.03	36.18	35.28			
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
	31.67	61.92	29.36	30.85	29.99	28.57			
	32.75	64.09	30.59	33.57	33.41	32.37			
	32.92	64.79	30.98	34.54	34.55	33.50			
	33.11	65.12	31.11	34.72	35.03	34.05			
	33.16	65.32	31.18	34.93	35.21	34.35			
	33.22	65.37	31.28	35.07	35.53	34.55			
	33.28	65.55	31.36	35.20	35.55	34.83			
	33.29	65.61	31.32	35.22	35.61	34.81			
MEAN / $\mu\text{g m}^{-3}$	33.16	65.29	31.21	34.95	35.25	34.35			
STDEV / $\mu\text{g m}^{-3}$	0.14	0.30	0.15	0.27	0.41	0.51			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 41: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 µg m⁻³.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
Delivered Conc / ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	38.08	34.65	50.67	43.58	40.39	50.27
ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
06/05/2010 15:16	37.83	34.62	49.34	42.55	39.86	50.22
06/05/2010 15:46	38.10	34.71	49.55	42.87	39.88	50.85
06/05/2010 16:16	38.13	34.60	49.57	42.45	40.00	50.83
06/05/2010 16:46	37.69	34.43	49.43	42.66	39.94	51.05
06/05/2010 17:16	37.82	34.63	49.38	42.61	39.87	50.67
06/05/2010 17:46	37.96	34.60	49.40	42.45	39.98	50.95
06/05/2010 18:16	37.80	34.27	49.33	42.83	38.38	50.04
06/05/2010 18:46	37.80	34.65	49.29	42.34	39.86	50.77
MEAN / ug m ⁻³	37.87	34.53	49.40	42.56	39.67	50.72
STDEV / ug m ⁻³	0.15	0.15	0.10	0.18	0.63	0.36

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 41 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
Delivered Conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	Delivered Conc / $\mu\text{g m}^{-3}$	ETHYLBENZENE	123-TMB
	47.28	94.18	46.54	50.16	50.37	49.12		47.28	49.12
$\mu\text{g m}^{-3}$	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB	$\mu\text{g m}^{-3}$	ETHYLBENZENE	123-TMB
06/05/2010 15:16	45.47	88.97	42.33	46.18	46.29	44.60	06/05/2010 15:16	45.47	44.60
06/05/2010 15:46	46.62	91.60	43.70	48.69	49.16	47.67	06/05/2010 15:46	46.62	47.67
06/05/2010 16:16	46.82	92.09	44.01	49.30	49.90	48.52	06/05/2010 16:16	46.82	48.52
06/05/2010 16:46	46.76	92.22	44.08	49.49	50.06	49.00	06/05/2010 16:46	46.76	49.00
06/05/2010 17:16	46.77	92.13	44.01	49.56	50.36	49.05	06/05/2010 17:16	46.77	49.05
06/05/2010 17:46	46.79	92.19	44.08	49.68	50.57	49.09	06/05/2010 17:46	46.79	49.09
06/05/2010 18:16	46.78	92.14	43.99	49.64	50.52	49.22	06/05/2010 18:16	46.78	49.22
06/05/2010 18:46	46.68	92.04	43.95	49.64	50.50	49.21	06/05/2010 18:46	46.68	49.21
MEAN / $\mu\text{g m}^{-3}$	46.77	92.14	44.02	49.55	50.32	49.02	MEAN / $\mu\text{g m}^{-3}$	46.77	49.02
STDEV / $\mu\text{g m}^{-3}$	0.05	0.06	0.05	0.14	0.28	0.26	STDEV / $\mu\text{g m}^{-3}$	0.05	0.26

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 42: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of $45 \mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).							
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
Delivered Span Conc / $\mu\text{g m}^{-3}$	48.61	44.23	64.68	55.63	51.56	64.17	
$\mu\text{g m}^{-3}$							
07/05/2010 09:46	48.60	44.49	65.30	56.67	51.20	63.92	
07/05/2010 10:16	48.87	44.81	65.06	56.67	51.79	65.33	
07/05/2010 10:46	48.32	44.61	64.12	53.22	50.66	65.20	
07/05/2010 11:16	49.00	44.47	63.91	54.15	50.14	64.63	
07/05/2010 11:46	48.82	44.79	64.56	54.50	51.04	64.22	
07/05/2010 12:16	48.73	44.77	64.61	55.71	51.57	65.53	
07/05/2010 12:46	48.81	44.38	63.70	54.37	50.10	63.78	
07/05/2010 13:16	48.61	44.23	64.68	55.63	51.56	64.17	
MEAN / $\mu\text{g m}^{-3}$	48.72	44.54	64.26	54.60	50.84	64.59	
STDEV / $\mu\text{g m}^{-3}$	0.24	0.22	0.41	0.94	0.66	0.67	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 42 (continued): Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 $\mu\text{g m}^{-3}$.

Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).											
Delivered Span Conc / $\mu\text{g m}^{-3}$		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB				
		60.35	120.22	59.41	64.04	64.31	62.70				
$\mu\text{g m}^{-3}$		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB				
07/05/2010 09:46		58.20	113.36	53.92	56.66	55.40	52.61				
07/05/2010 10:16		59.59	116.84	55.87	61.12	61.00	58.41				
07/05/2010 10:46		59.98	117.99	56.46	62.49	62.49	60.80				
07/05/2010 11:16		60.35	120.10	59.47	63.11	63.65	61.79				
07/05/2010 11:46		60.25	118.51	56.74	63.62	63.89	62.33				
07/05/2010 12:16		60.36	120.37	59.75	63.65	64.46	62.59				
07/05/2010 12:46		60.32	120.34	59.61	63.62	64.25	62.68				
07/05/2010 13:16		60.35	120.22	59.41	64.04	64.31	62.70				
MEAN / $\mu\text{g m}^{-3}$		60.27	119.59	58.57	63.42	63.84	62.15				
STDEV / $\mu\text{g m}^{-3}$		0.15	1.05	1.53	0.54	0.72	0.74				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 43: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE				
Delivered conc / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00				
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE				
$\mu\text{g m}^{-3}$									
04/05/2010 09:28	0.28	0.00	0.00	0.00	0.79				
04/05/2010 09:58	0.00	0.00	0.00	0.00	0.15				
04/05/2010 10:28	0.00	0.00	0.00	0.00	0.00				
04/05/2010 10:58	0.00	0.00	0.00	0.00	0.00				
04/05/2010 11:28	0.00	0.00	0.00	0.00	0.00				
04/05/2010 11:58	0.00	0.00	0.00	0.00	0.00				
04/05/2010 12:28	0.00	0.00	0.00	0.00	0.00				
04/05/2010 12:58	0.00	0.00	0.00	0.00	0.00				
MEAN / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00				
STDEV / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 44: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 5 µg m⁻³.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).					BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
					4.90	5.72	6.69	13.33	6.59
Delivered conc / µg m ⁻³									
ug m ⁻³					BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
05/05/2010 10:46					4.42	5.91	7.26	15.71	7.22
05/05/2010 11:16					4.39	6.07	7.40	15.92	6.79
05/05/2010 11:46					4.32	5.98	7.57	16.40	6.99
05/05/2010 12:16					4.41	6.16	7.46	16.05	6.75
05/05/2010 12:46					4.29	5.98	7.56	16.43	6.93
05/05/2010 13:16					4.34	6.00	7.15	15.38	6.49
05/05/2010 13:46					4.31	6.05	7.64	16.58	7.01
05/05/2010 14:16					4.39	6.00	7.23	15.54	6.52
MEAN / µg m ⁻³					4.34	6.03	7.43	16.06	6.78
STDEV / µg m ⁻³					0.05	0.07	0.20	0.50	0.23

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 45: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).					
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Delivered conc / ug m ⁻³	14.98	17.46	20.44	40.71	20.12
ug m ³					
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
07/05/2010 09:46	12.04	15.63	18.60	38.60	16.85
07/05/2010 10:16	14.39	17.44	20.42	42.08	18.80
07/05/2010 10:46	14.14	18.08	22.00	45.53	20.45
07/05/2010 11:16	13.87	16.78	20.26	41.94	18.79
07/05/2010 11:46	14.24	18.24	22.26	46.09	20.69
07/05/2010 12:16	13.90	16.85	20.67	42.72	19.06
07/05/2010 12:46	14.05	17.94	22.01	45.61	20.53
07/05/2010 13:16	13.40	16.55	20.34	42.12	18.82
MEAN / ug m ⁻³	13.93	17.41	21.26	44.00	19.73
STDEV / ug m ⁻³	0.30	0.76	0.93	1.93	0.92

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 46: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 $\mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered conc / $\mu\text{g m}^{-3}$	24.88	29.01	33.96	67.64	33.42	
ug m⁻³						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
07/05/2010 09:46	23.92	28.82	34.20	68.27	31.62	
07/05/2010 10:16	24.94	30.27	36.08	72.35	33.50	
07/05/2010 10:46	23.96	29.07	34.89	69.95	32.55	
07/05/2010 11:16	25.20	30.70	36.80	73.93	34.32	
07/05/2010 11:46	24.18	29.38	35.23	70.79	32.87	
07/05/2010 12:16	25.10	30.55	36.54	73.46	34.10	
07/05/2010 12:46	24.15	29.51	35.68	71.69	33.26	
07/05/2010 13:16	25.05	30.59	36.93	74.09	34.40	
MEAN / $\mu\text{g m}^{-3}$	24.61	29.97	36.01	72.32	33.58	
STDEV / $\mu\text{g m}^{-3}$	0.57	0.72	0.86	1.75	0.79	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 47: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).					
Delivered conc / ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	34.87	40.64	47.58	94.78	46.83
ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
06/05/2010 15:16	34.15	40.24	47.69	93.65	44.20
06/05/2010 15:46	36.03	42.23	50.51	102.07	50.92
06/05/2010 16:16	34.35	40.45	48.21	94.93	44.87
06/05/2010 16:46	35.80	41.87	50.23	101.10	50.55
06/05/2010 17:16	34.98	41.04	49.18	98.88	49.44
06/05/2010 17:46	36.19	42.42	50.94	102.45	51.18
06/05/2010 18:16	34.61	40.80	48.88	98.35	47.59
06/05/2010 18:46	35.72	42.05	50.27	101.36	50.75
MEAN / ug m ³	35.27	41.44	49.62	99.51	49.06
STDEV / ug m ³	0.73	0.79	1.03	2.73	2.43

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 48: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 µg m⁻³.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).					BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
					44.23	51.56	60.35	120.22	59.41
Delivered conc / ug m ⁻³									
ug m ⁻³					BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
07/05/2010 09:46					45.01	48.35	54.32	107.12	54.60
07/05/2010 10:16					43.36	49.83	58.83	116.00	57.28
07/05/2010 10:46					43.93	47.42	55.08	109.73	55.67
07/05/2010 11:16					44.53	51.80	60.47	119.71	59.37
07/05/2010 11:46					43.86	48.45	56.46	112.29	56.64
07/05/2010 12:16					44.03	50.32	60.00	119.33	59.45
07/05/2010 12:46					41.98	46.59	55.51	110.67	54.11
07/05/2010 13:16					44.23	51.56	60.35	120.22	59.41
MEAN / ug m ⁻³					43.76	49.36	57.98	115.33	57.44
STDEV / ug m ⁻³					0.91	2.19	2.56	4.93	2.30

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 49: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered conc / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00	
ug m⁻³						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
04/05/2010 09:28	0.37	0.20	0.00	0.00	1.12	
04/05/2010 09:58	0.00	0.00	0.00	0.00	0.16	
04/05/2010 10:28	0.00	0.00	0.00	0.00	0.00	
04/05/2010 10:58	0.00	0.00	0.00	0.00	0.00	
04/05/2010 11:28	0.00	0.00	0.00	0.00	0.00	
04/05/2010 11:58	0.00	0.00	0.00	0.00	0.00	
04/05/2010 12:28	0.00	0.00	0.00	0.00	0.00	
04/05/2010 12:58	0.00	0.00	0.00	0.00	0.00	
MEAN / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00	
STDEV / $\mu\text{g m}^{-3}$	0.00	0.00	0.00	0.00	0.00	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 50: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of $5 \mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).					
Delivered conc / ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	4.90	5.72	6.69	13.33	6.59
ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
07/05/2010 09:46	4.43	5.45	6.57	14.03	6.46
07/05/2010 10:16	4.27	5.63	6.83	14.58	5.66
07/05/2010 10:46	4.19	5.58	6.99	15.08	5.80
07/05/2010 11:16	4.25	5.63	6.92	14.79	5.62
07/05/2010 11:46	4.25	5.62	7.01	15.09	5.76
07/05/2010 12:16	4.24	5.59	6.80	14.51	5.53
07/05/2010 12:46	4.24	5.62	7.05	15.21	5.82
07/05/2010 13:16	4.24	5.59	6.82	14.57	5.51
MEAN / ug m ⁻³	4.24	5.60	6.93	14.87	5.67
STDEV / ug m ⁻³	0.02	0.02	0.10	0.29	0.14

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 51: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).					BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
					14.98	17.46	20.44	40.71	20.12
Delivered conc / $\mu\text{g m}^{-3}$									
$\mu\text{g m}^{-3}$					BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
07/05/2010 09:46					11.90	14.92	17.63	36.15	14.77
07/05/2010 10:16					14.09	16.91	20.11	41.16	17.00
07/05/2010 10:46					14.02	17.35	21.17	43.46	17.90
07/05/2010 11:16					13.83	16.65	20.26	41.50	17.02
07/05/2010 11:46					14.02	17.42	21.36	43.92	18.14
07/05/2010 12:16					13.83	16.71	20.46	41.90	17.15
07/05/2010 12:46					13.94	17.39	21.26	43.76	18.07
07/05/2010 13:16					13.67	16.62	20.30	41.66	17.24
MEAN / $\mu\text{g m}^{-3}$					13.89	17.02	20.80	42.70	17.59
STDEV / $\mu\text{g m}^{-3}$					0.14	0.40	0.51	1.13	0.51

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 52: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 µg m⁻³.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
Delivered conc / ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
	24.88	29.01	33.96	67.64	33.42	
ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
06/05/2010 10:16	24.09	28.35	33.00	67.11	31.10	
06/05/2010 10:46	24.38	28.86	34.84	71.14	33.34	
06/05/2010 11:16	24.19	28.98	34.50	70.61	33.06	
06/05/2010 11:46	24.78	29.90	35.57	72.84	34.17	
06/05/2010 12:16	24.28	29.28	34.78	71.10	33.30	
06/05/2010 12:46	24.78	29.95	35.56	72.91	34.19	
06/05/2010 13:16	24.36	29.32	35.16	72.02	33.36	
06/05/2010 13:46	24.52	30.06	35.84	73.60	34.18	
MEAN / ug m ⁻³	24.49	29.58	35.24	72.18	33.71	
STDEV / ug m ⁻³	0.25	0.44	0.52	1.15	0.53	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 53: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
Delivered conc / $\mu\text{g m}^{-3}$	34.87	40.64	47.58	94.78	46.83	
$\mu\text{g m}^{-3}$						
06/05/2010 15:16	34.27	39.94	46.68	93.87	44.68	
06/05/2010 15:46	35.32	41.60	48.98	98.61	47.38	
06/05/2010 16:16	34.49	40.66	48.08	97.01	46.32	
06/05/2010 16:46	35.07	41.32	49.00	98.74	47.33	
06/05/2010 17:16	34.69	40.85	48.41	97.50	46.84	
06/05/2010 17:46	35.25	41.69	49.38	99.87	47.90	
06/05/2010 18:16	34.56	40.80	48.29	97.51	46.66	
06/05/2010 18:46	35.13	41.54	49.11	99.19	47.59	
MEAN / $\mu\text{g m}^{-3}$	34.87	41.14	48.71	98.30	47.11	
STDEV / $\mu\text{g m}^{-3}$	0.32	0.43	0.52	1.13	0.60	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 54: Lack of fit tests for Chromatotec 7GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 µg m⁻³.

Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
Delivered Span Conc / ug m ⁻³		BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
		44.23	51.56	60.35	120.22	59.41
ug m ³		BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
07/05/2010 09:46		44.38	48.60	54.15	106.66	52.52
07/05/2010 10:16		44.33	51.23	58.99	116.70	57.13
07/05/2010 10:46		44.07	49.66	57.00	113.06	55.18
07/05/2010 11:16		44.74	52.01	60.33	119.93	58.57
07/05/2010 11:46		44.09	49.83	57.86	114.96	55.96
07/05/2010 12:16		44.37	51.57	59.98	119.36	58.33
07/05/2010 12:46		43.03	49.24	57.38	114.10	56.10
07/05/2010 13:16		44.23	51.56	60.35	120.22	59.41
MEAN / ug m ⁻³		44.09	50.64	58.82	116.94	57.26
STDEV / ug m ⁻³		0.57	1.20	1.56	3.24	1.72

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Chromatotec FID 20730509

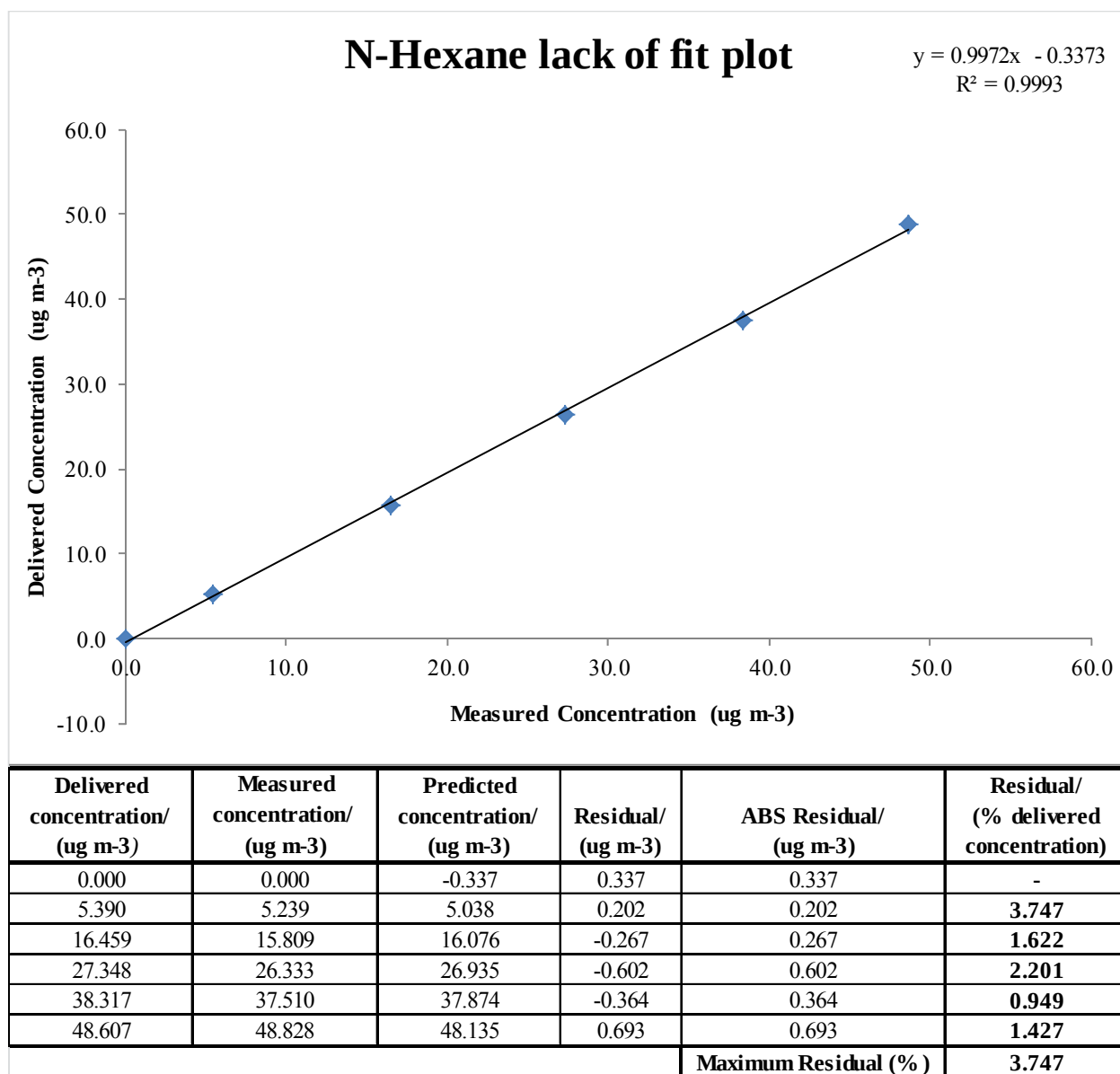


Figure 26: Lack of fit test linear regression for Chromatotec FID 20730509

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

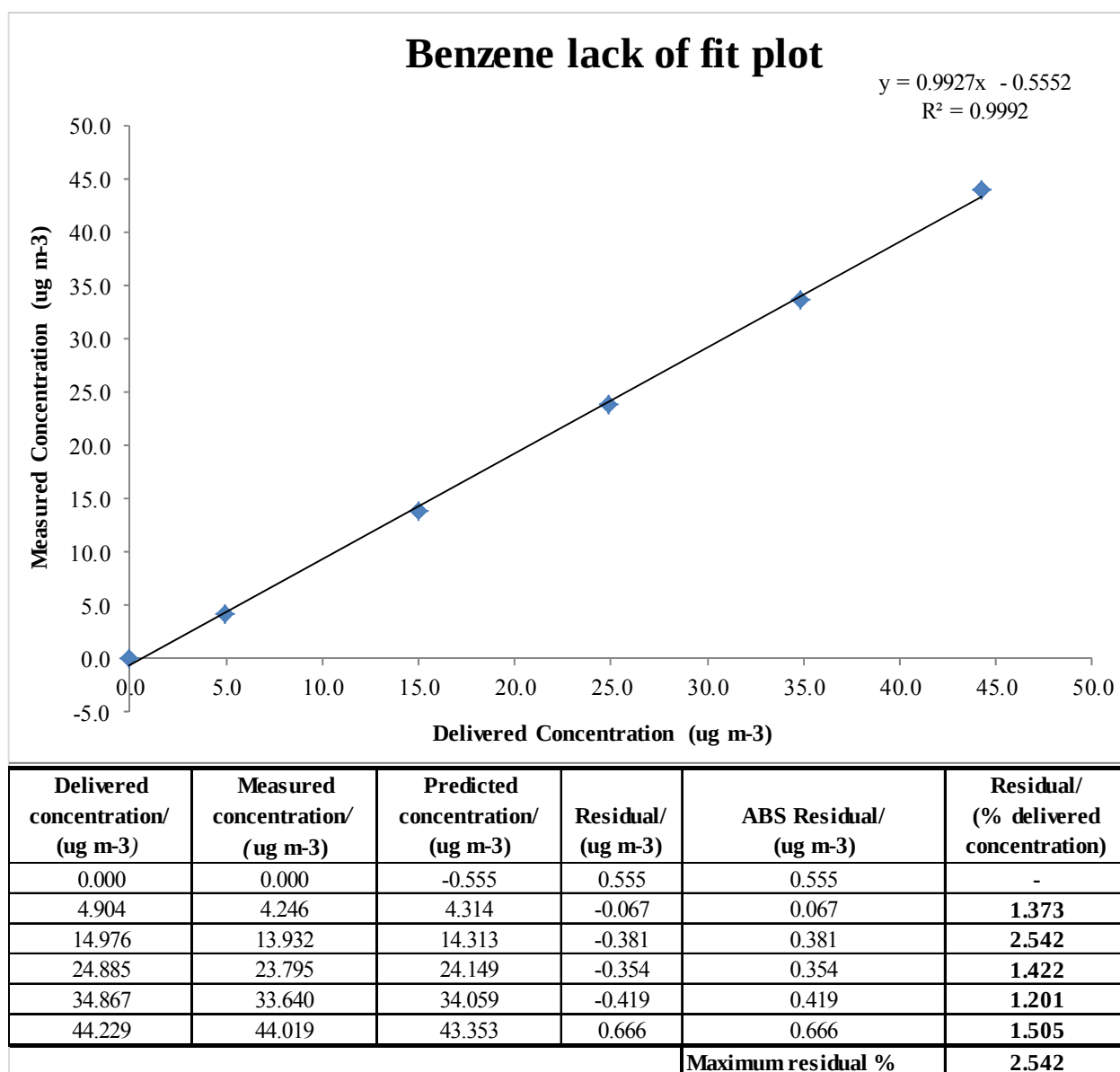


Figure 27: Lack of fit test linear regression for Chromatotec FID 20730509 (Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

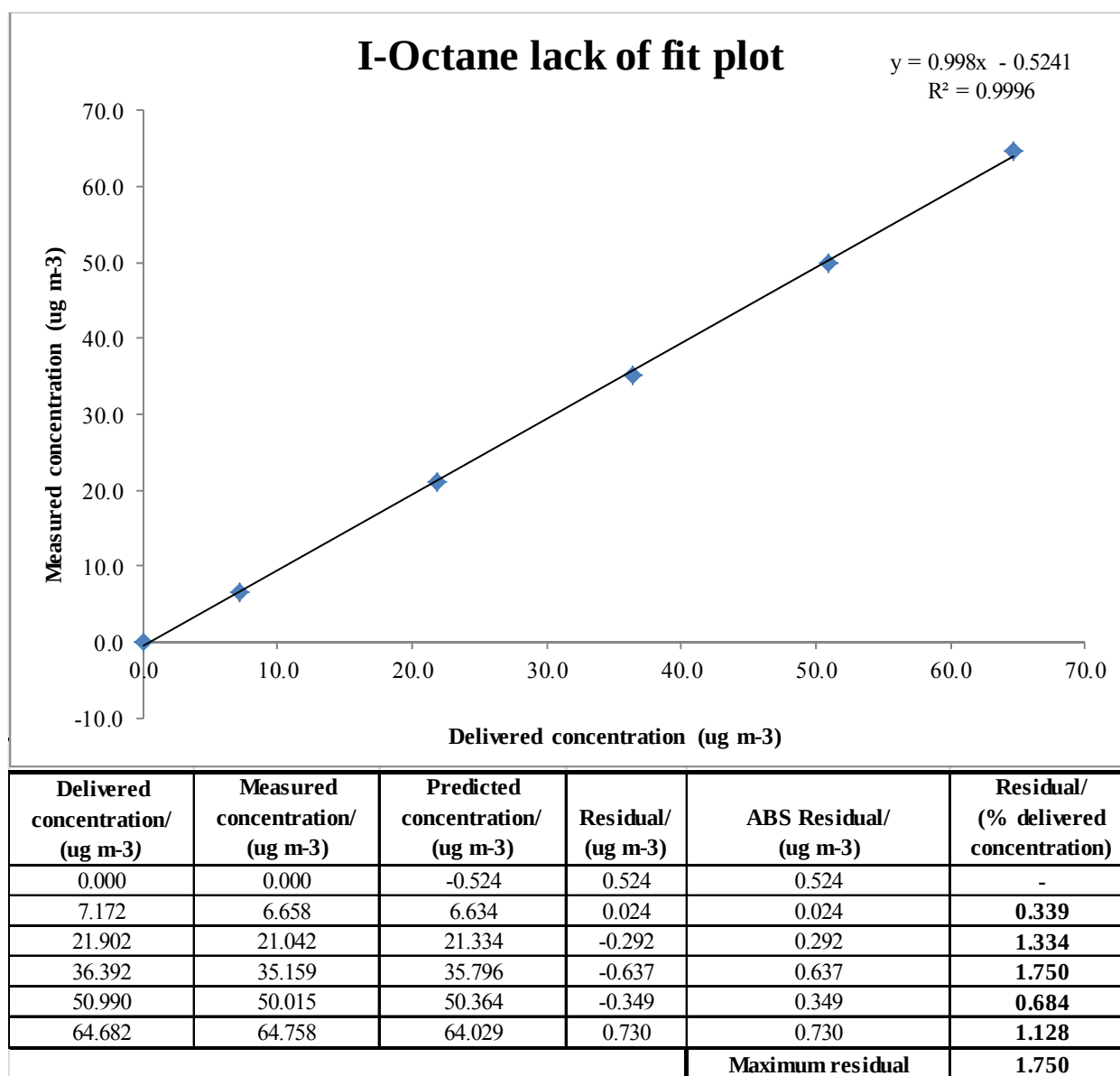


Figure 28: Lack of fit test linear regression for Chromatotec FID 20730509 (I-Octane)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

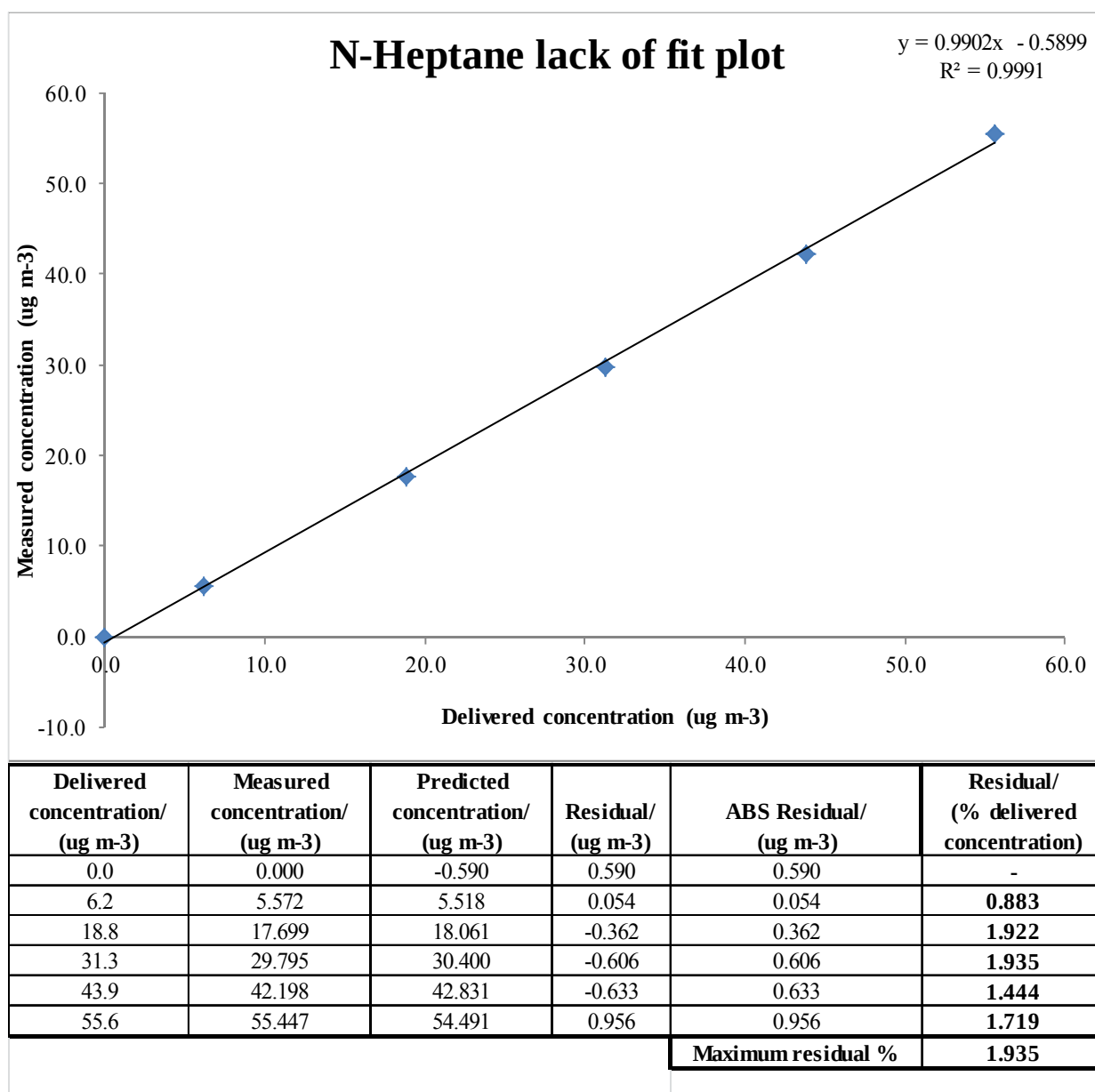


Figure 29: Lack of fit test linear regression for Chromatotec FID 20730509 (N-Heptane)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

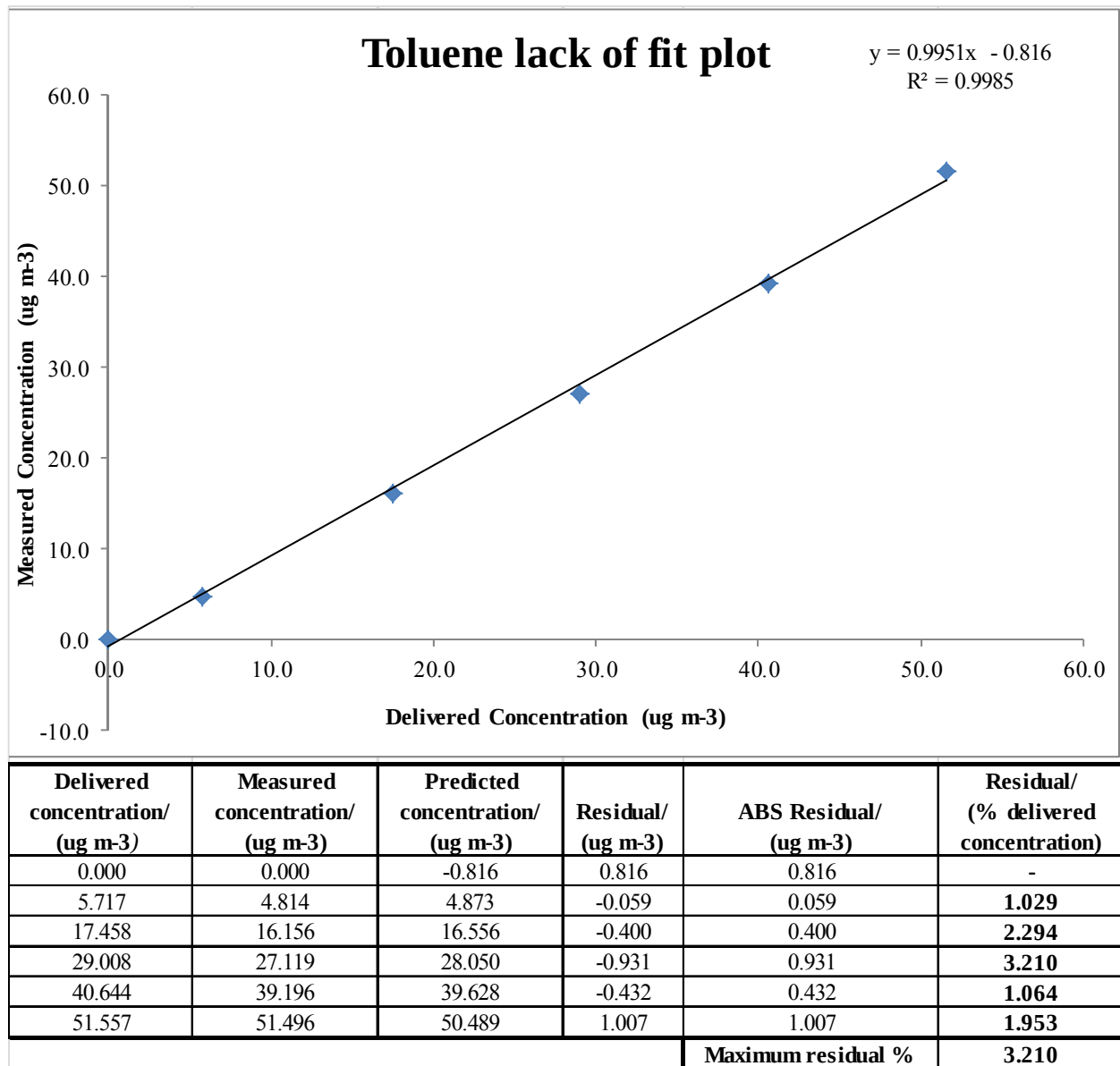


Figure 30: Lack of fit test linear regression for Chromatotec FID 20730509 (Toluene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

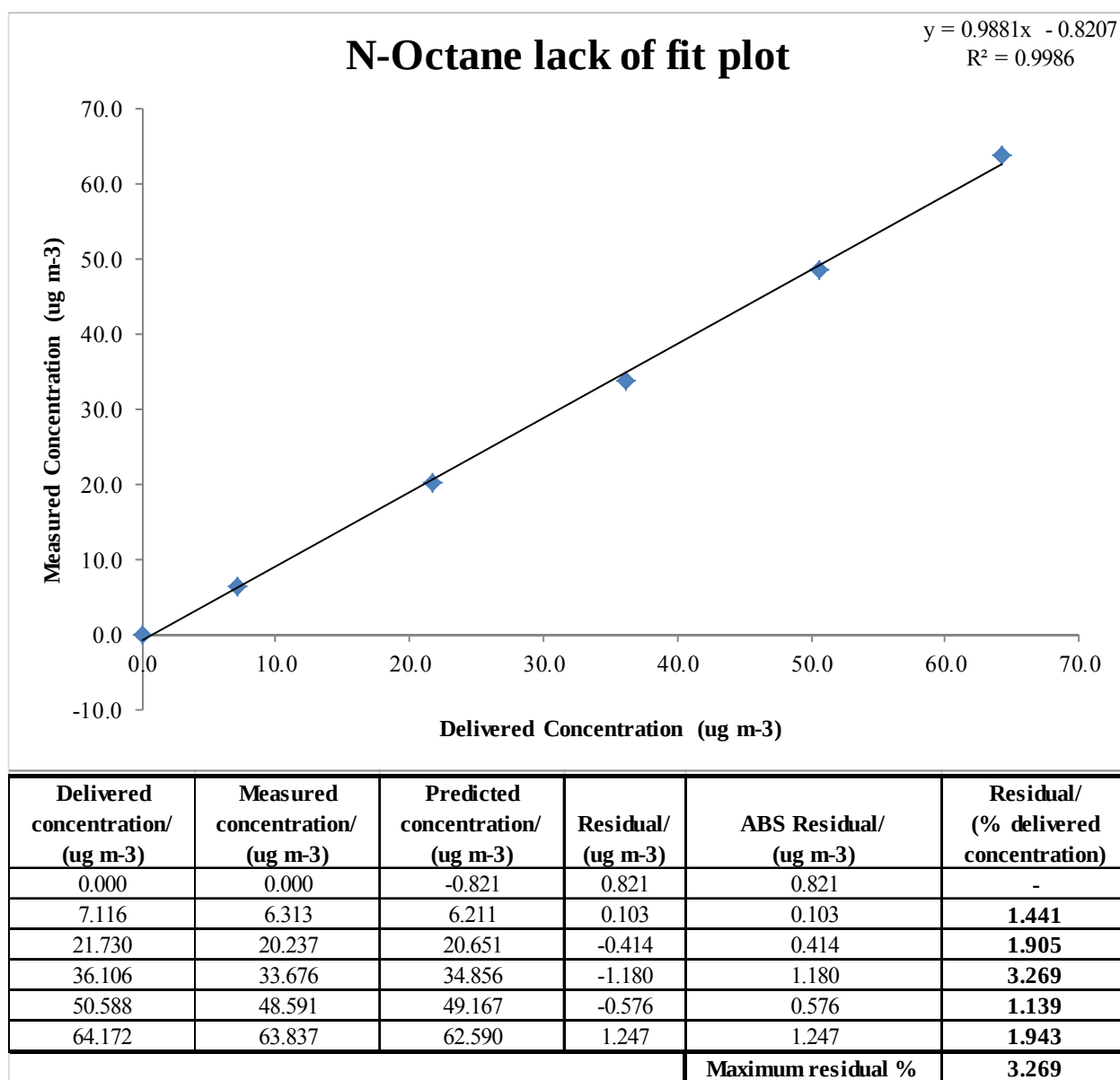


Figure 31: Lack of fit test linear regression for Chromatotec FID 20730509 (N-Octane)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

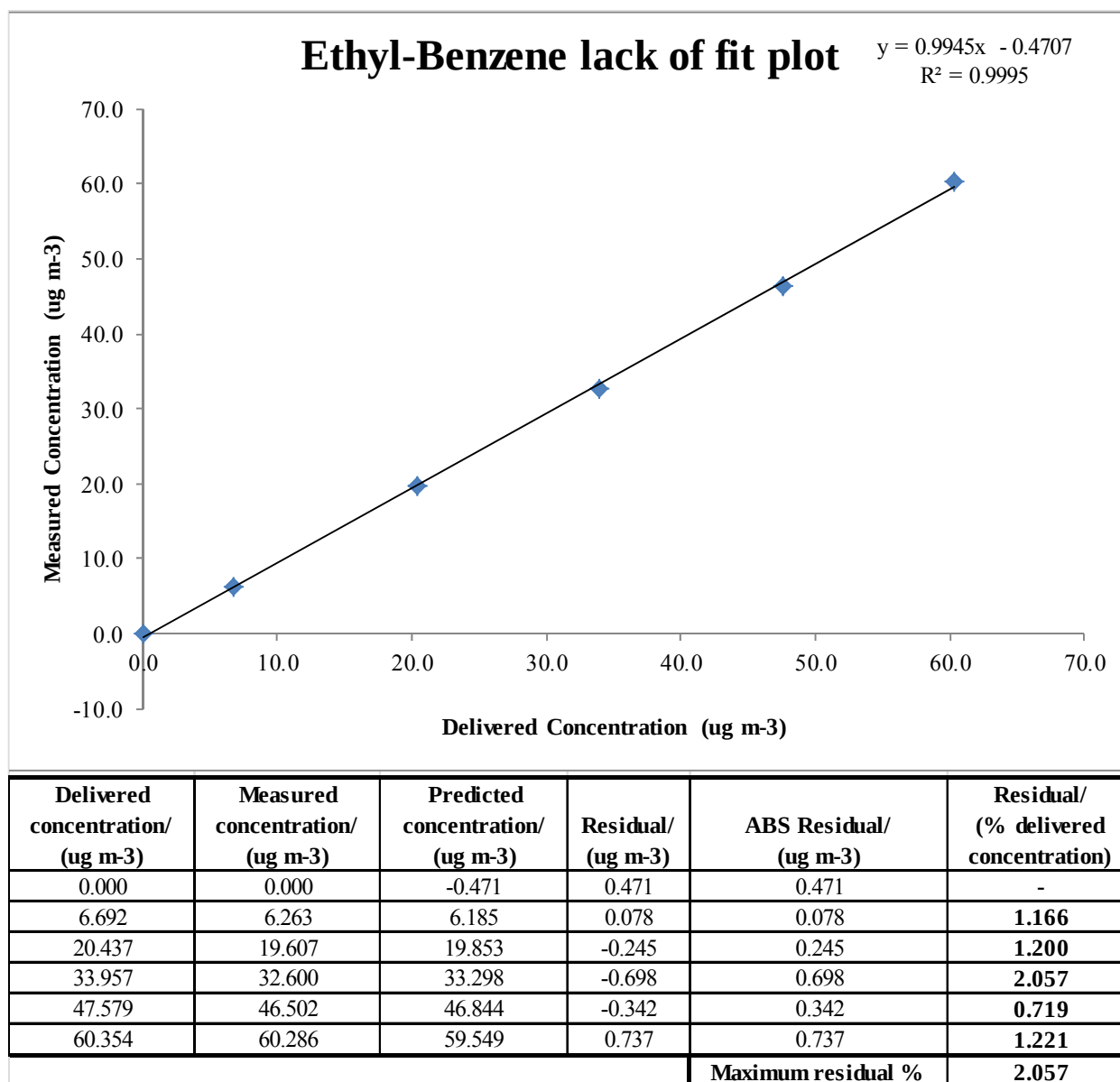


Figure 32: Lack of fit test linear regression for Chromatotec FID 20730509 (Ethyl-Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

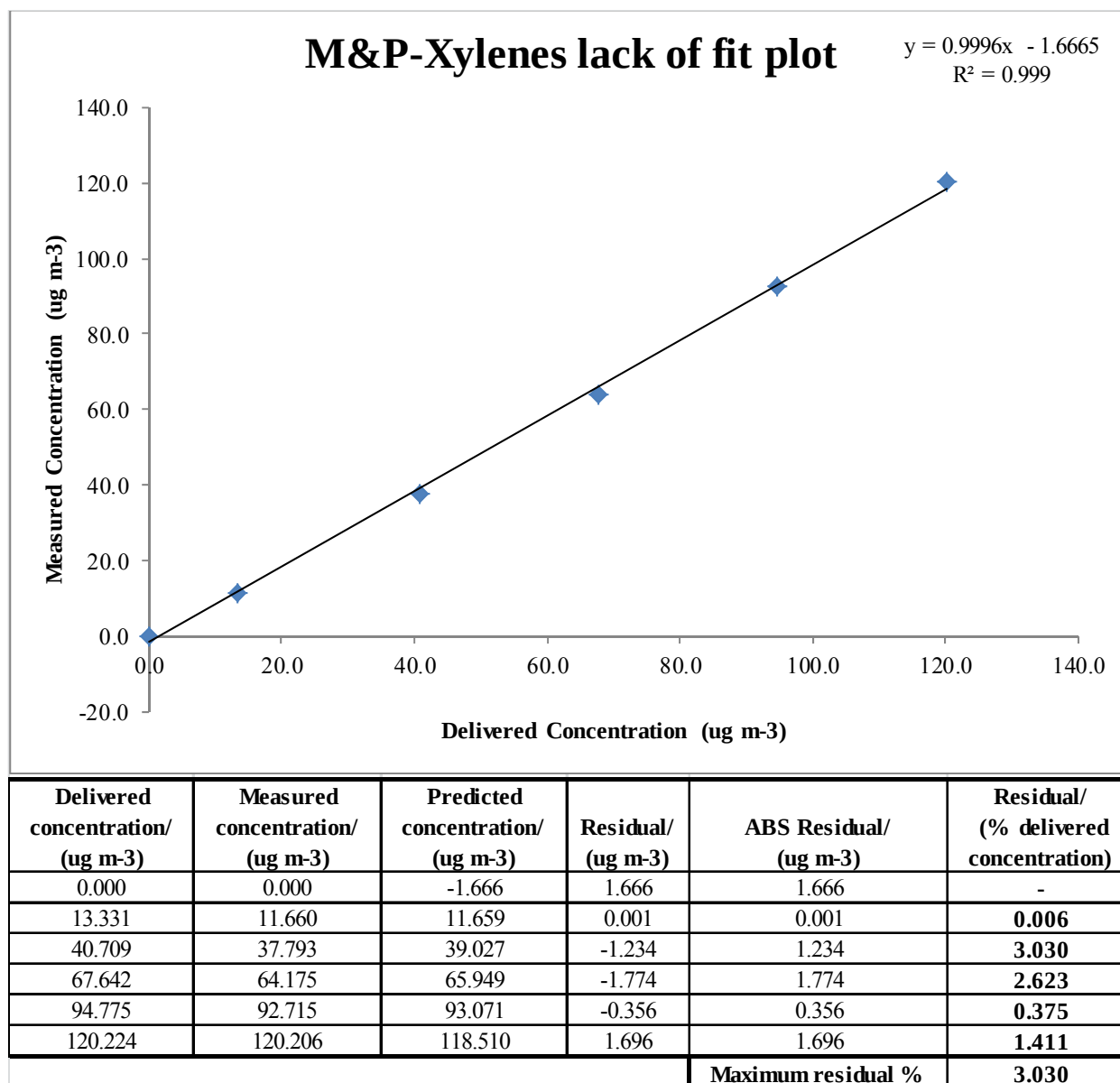


Figure 33: Lack of fit test linear regression for Chromatotec FID 20730509 (M&P-Xylenes)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

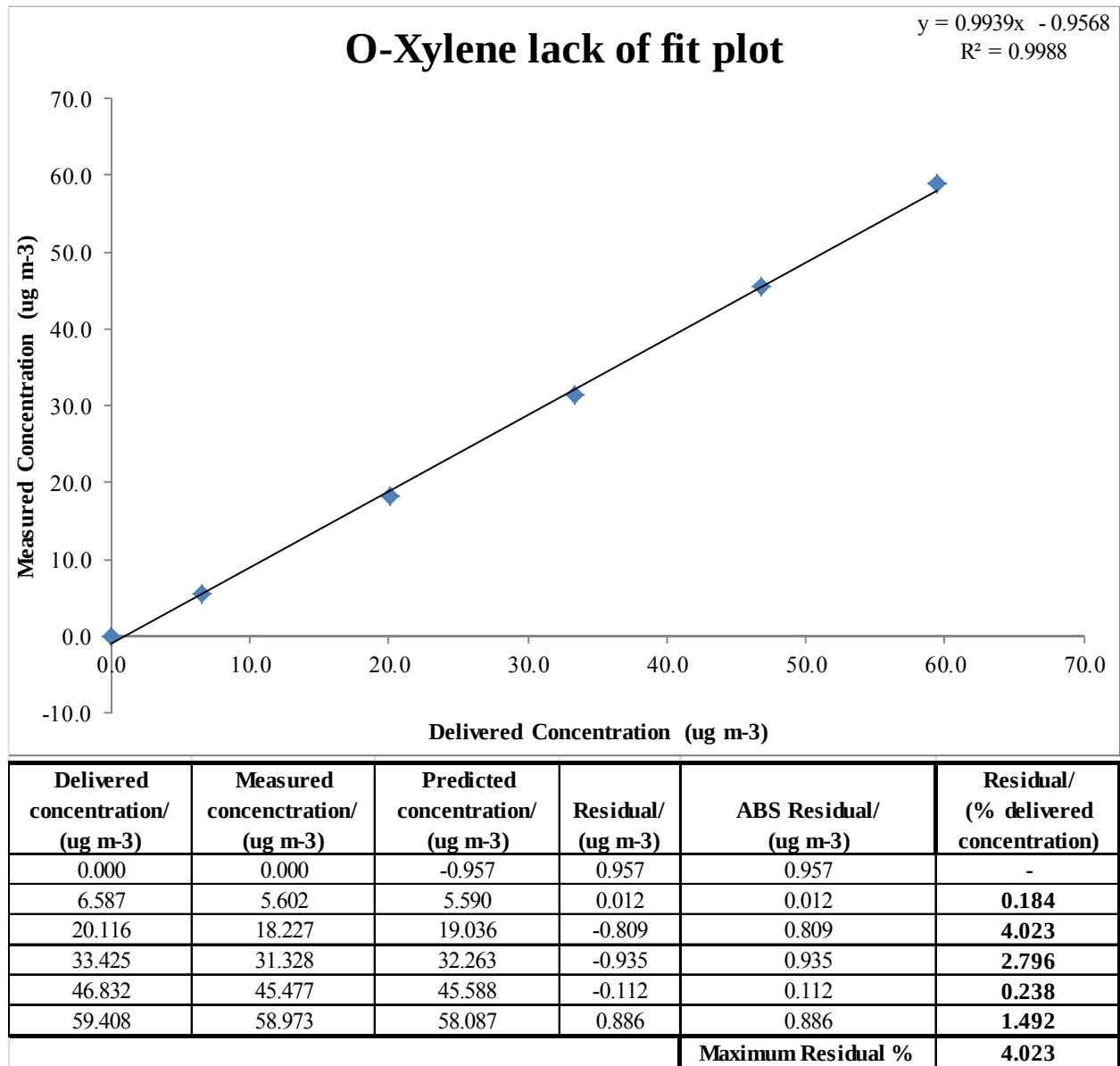


Figure 34: Lack of fit test linear regression for Chromatotec FID 20730509 (O-Xylene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

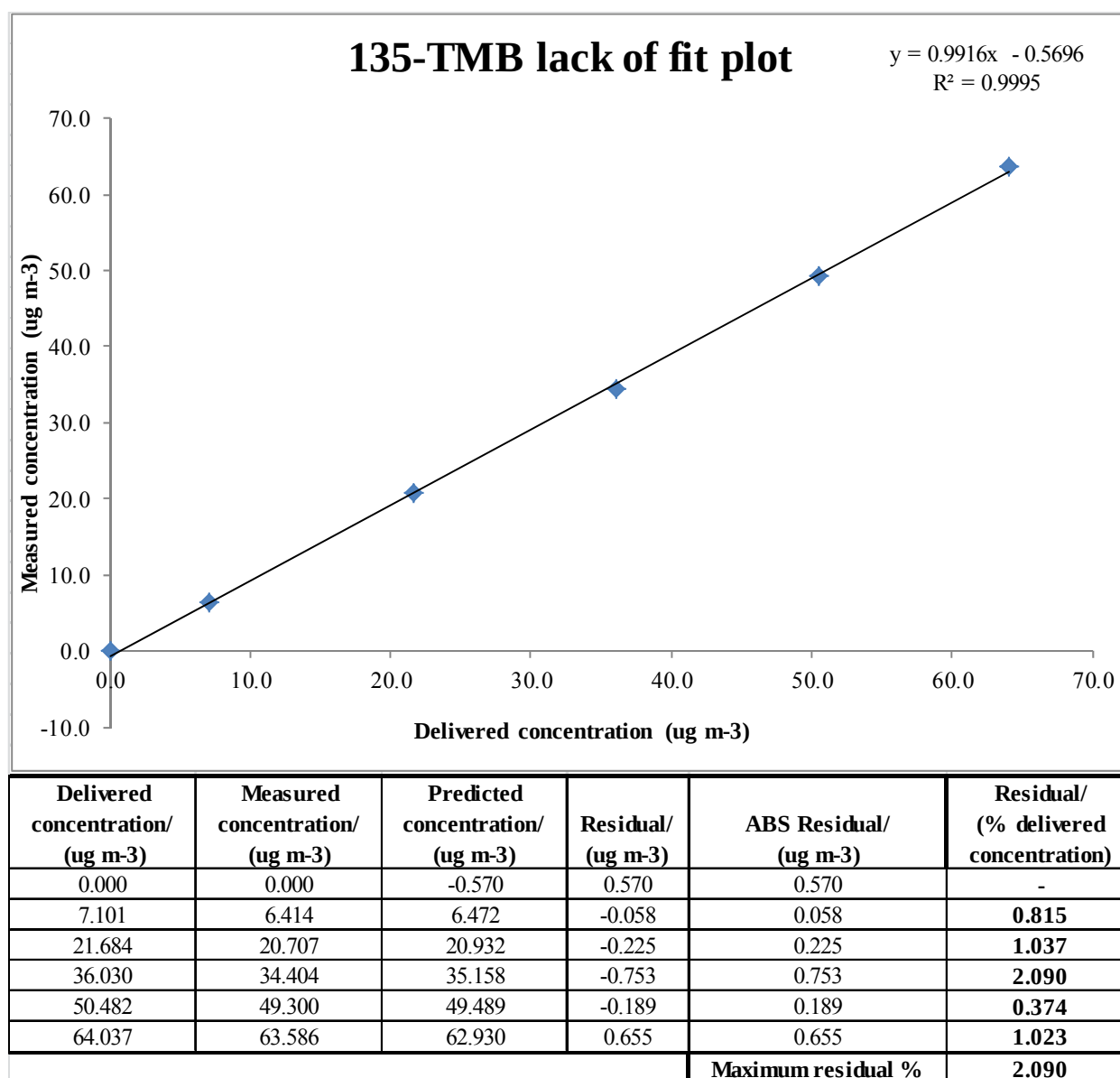


Figure 35: Lack of fit test linear regression for Chromatotec FID 20730509 (1,3,5-TMB)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

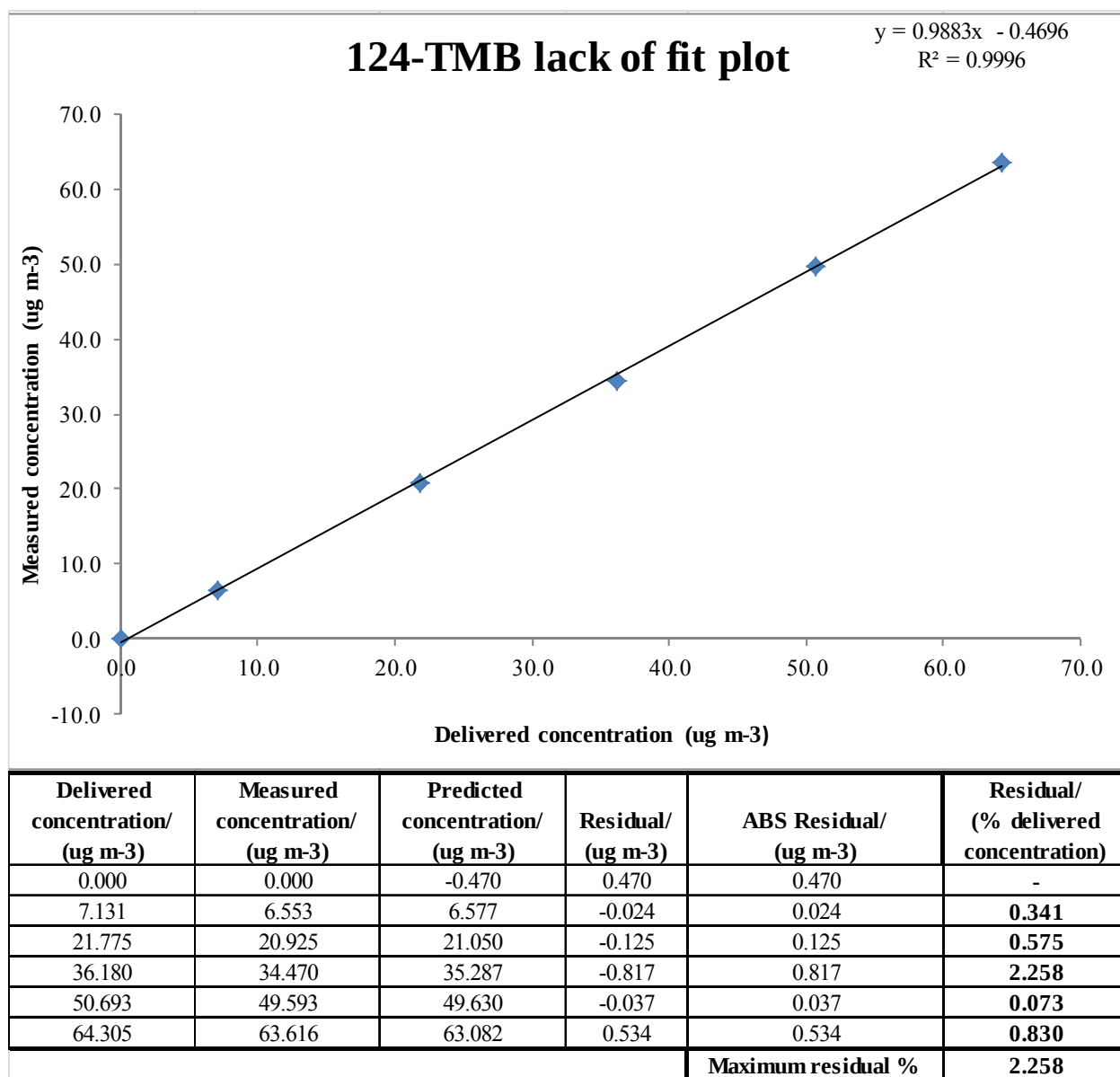


Figure 36: Lack of fit test linear regression for Chromatotec FID 20730509 (1,2,4-TMB)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

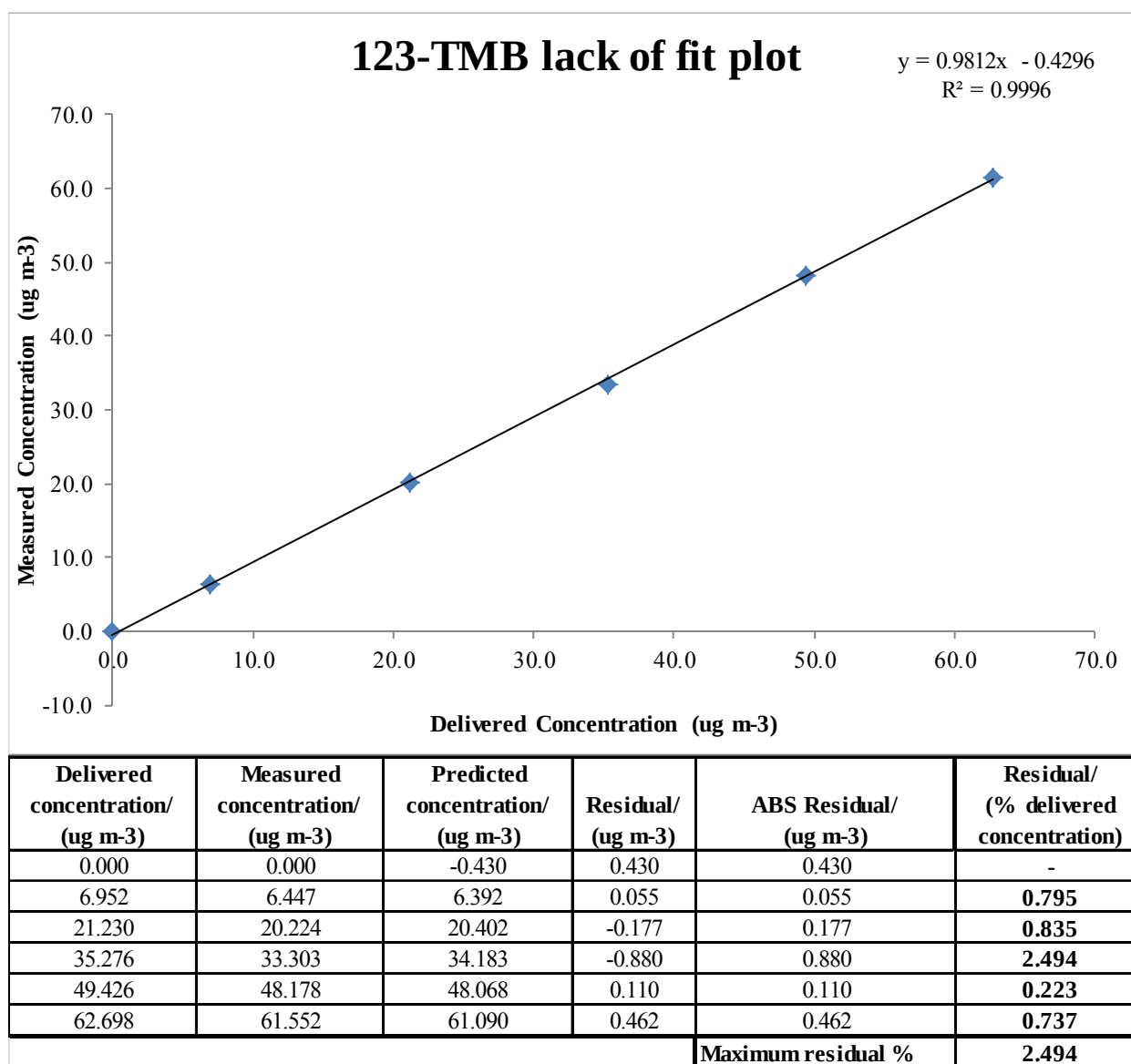


Figure 37: Lack of fit test linear regression for Chromatotec FID 20730509 (1,2,3-TMB)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Chromatotec FID 20190309

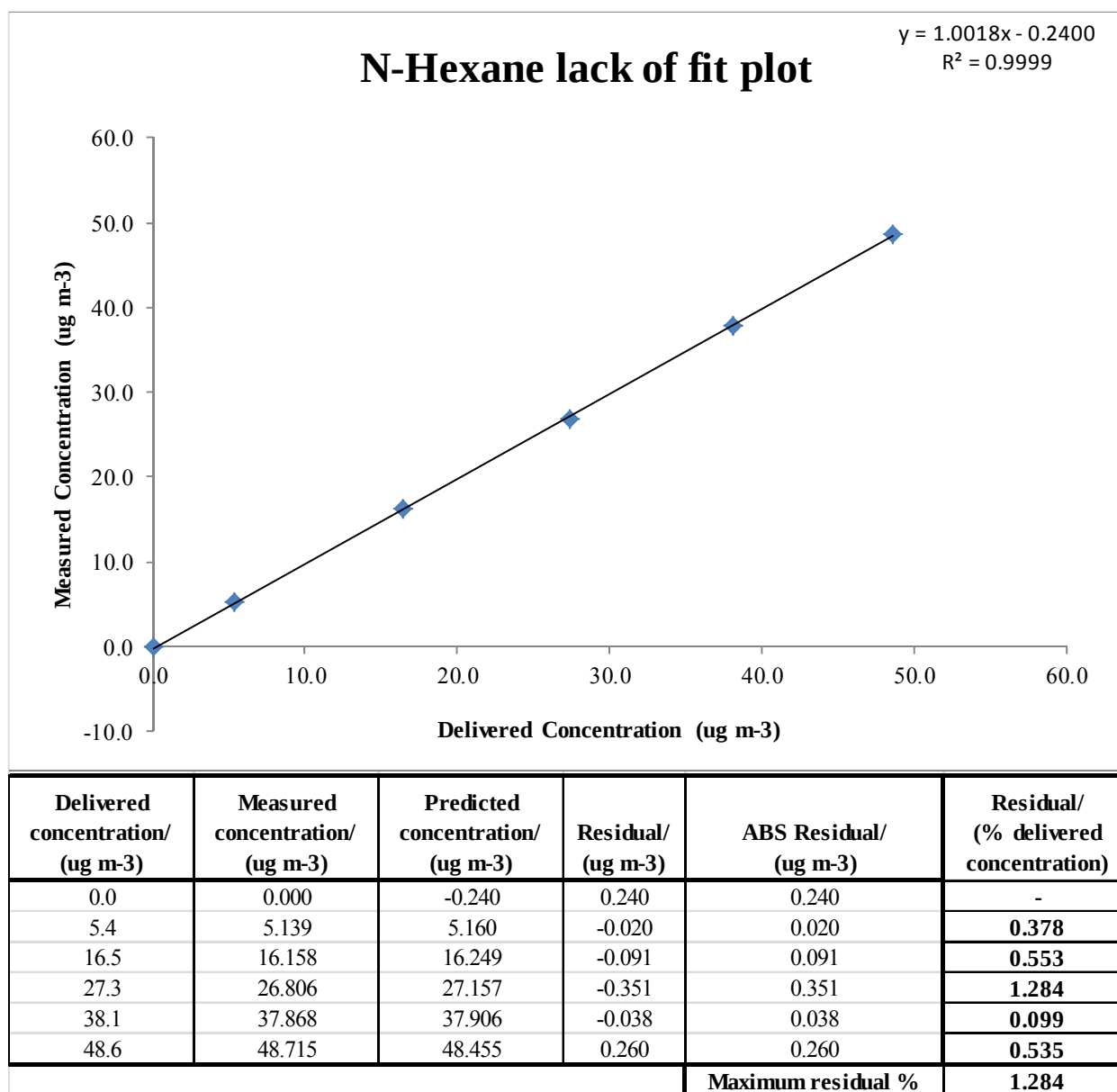


Figure 38: Lack of fit test linear regression for Chromatotec FID 20190309 (N-Hexane)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

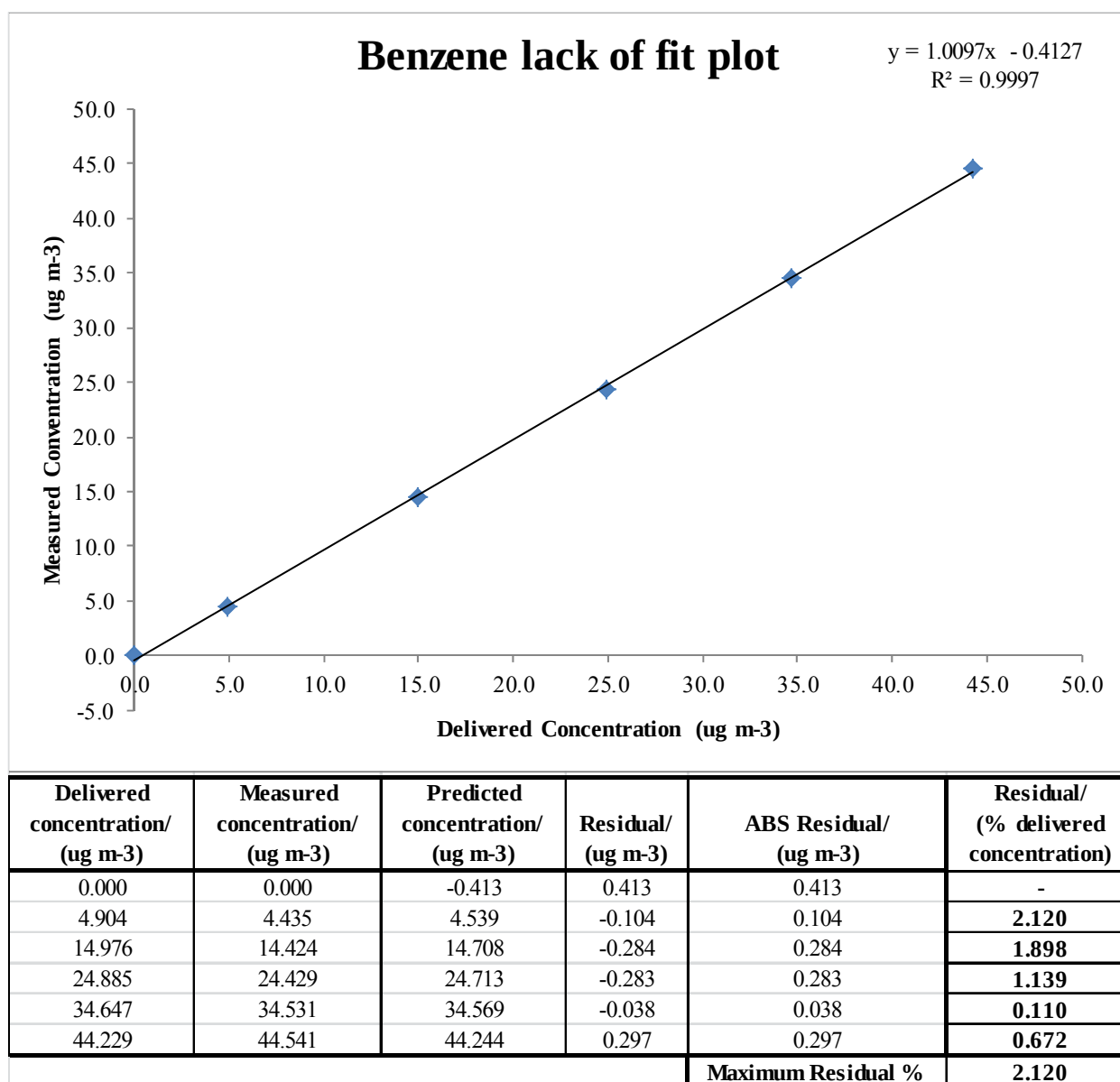


Figure 39: Lack of fit test linear regression for Chromatotec FID 20190309 (Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

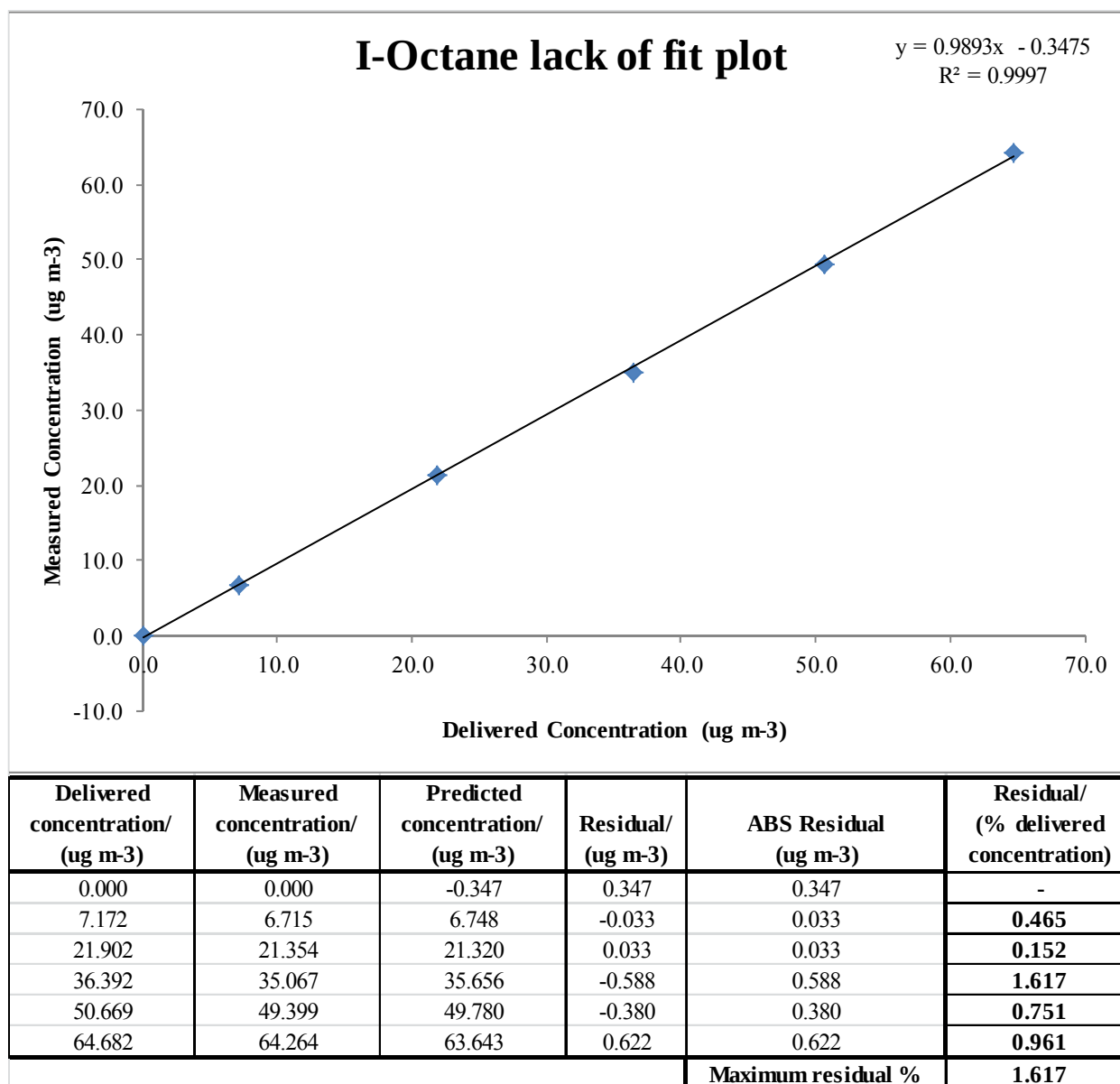


Figure 40: Lack of fit test linear regression for Chromatotec FID 20190309 (I-Octane)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

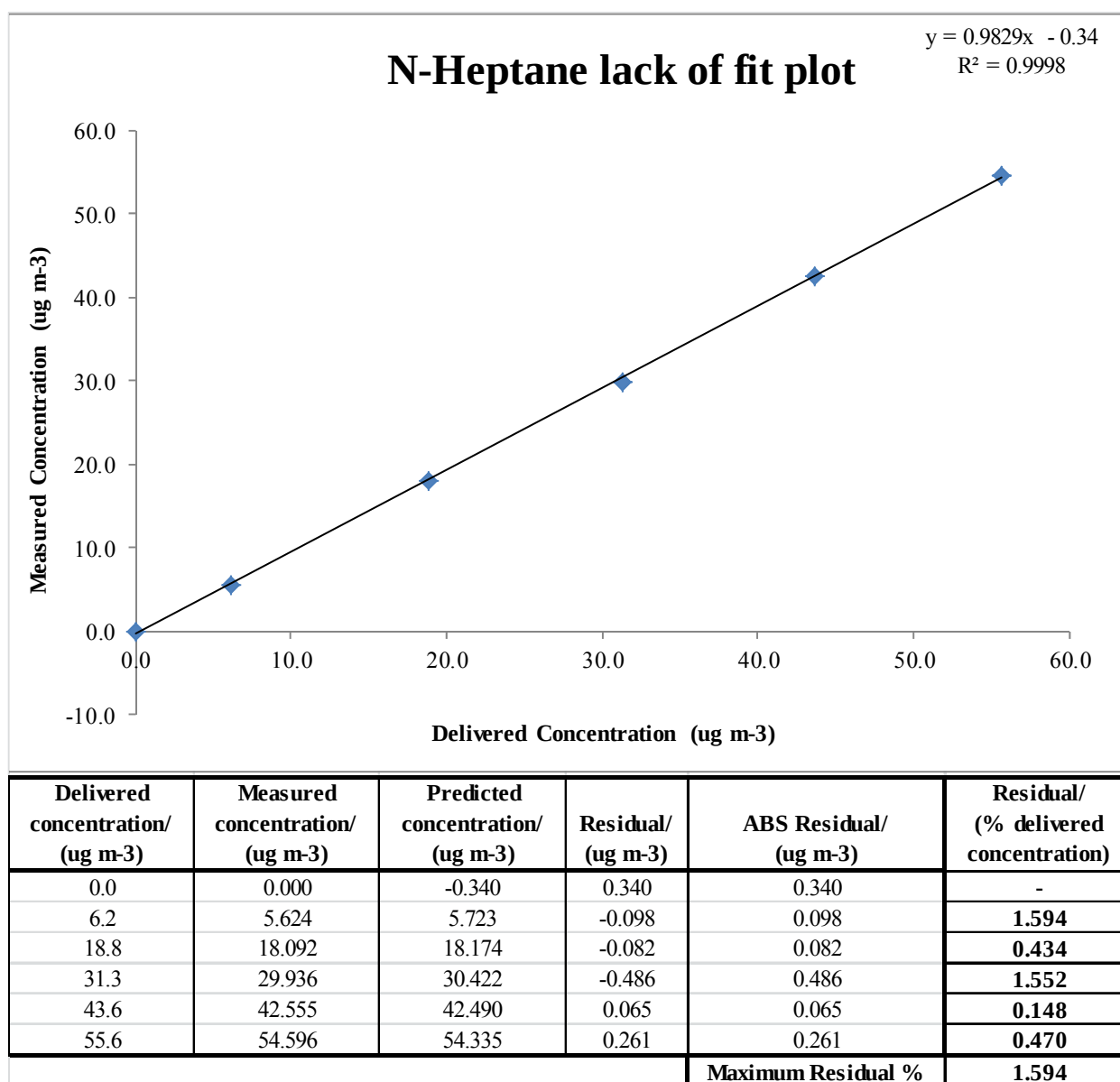


Figure 41: Lack of fit test linear regression for Chromatotec FID 20190309 (N-Heptane)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

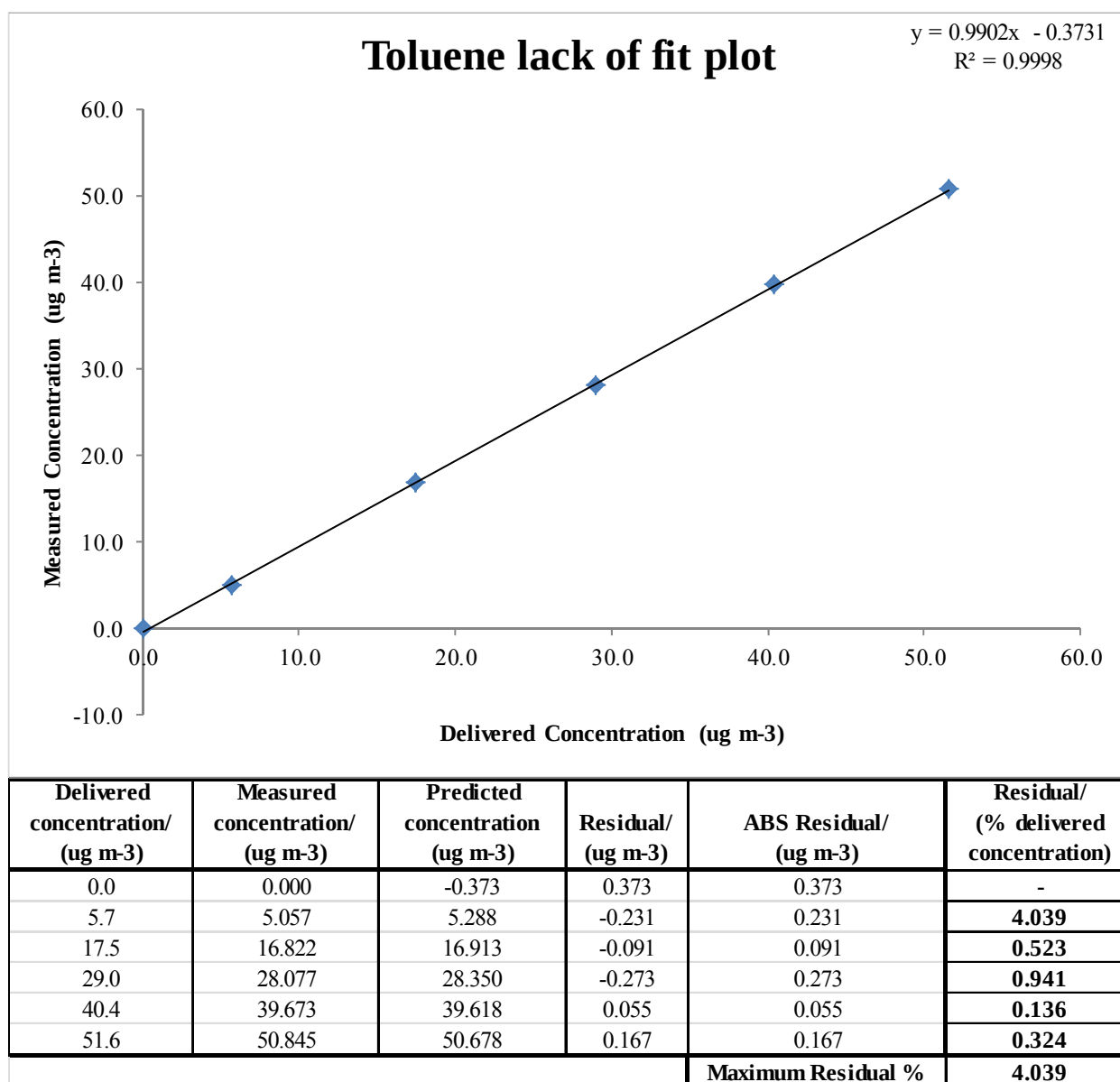


Figure 42: Lack of fit test linear regression for Chromatotec FID 20190309 (Toluene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

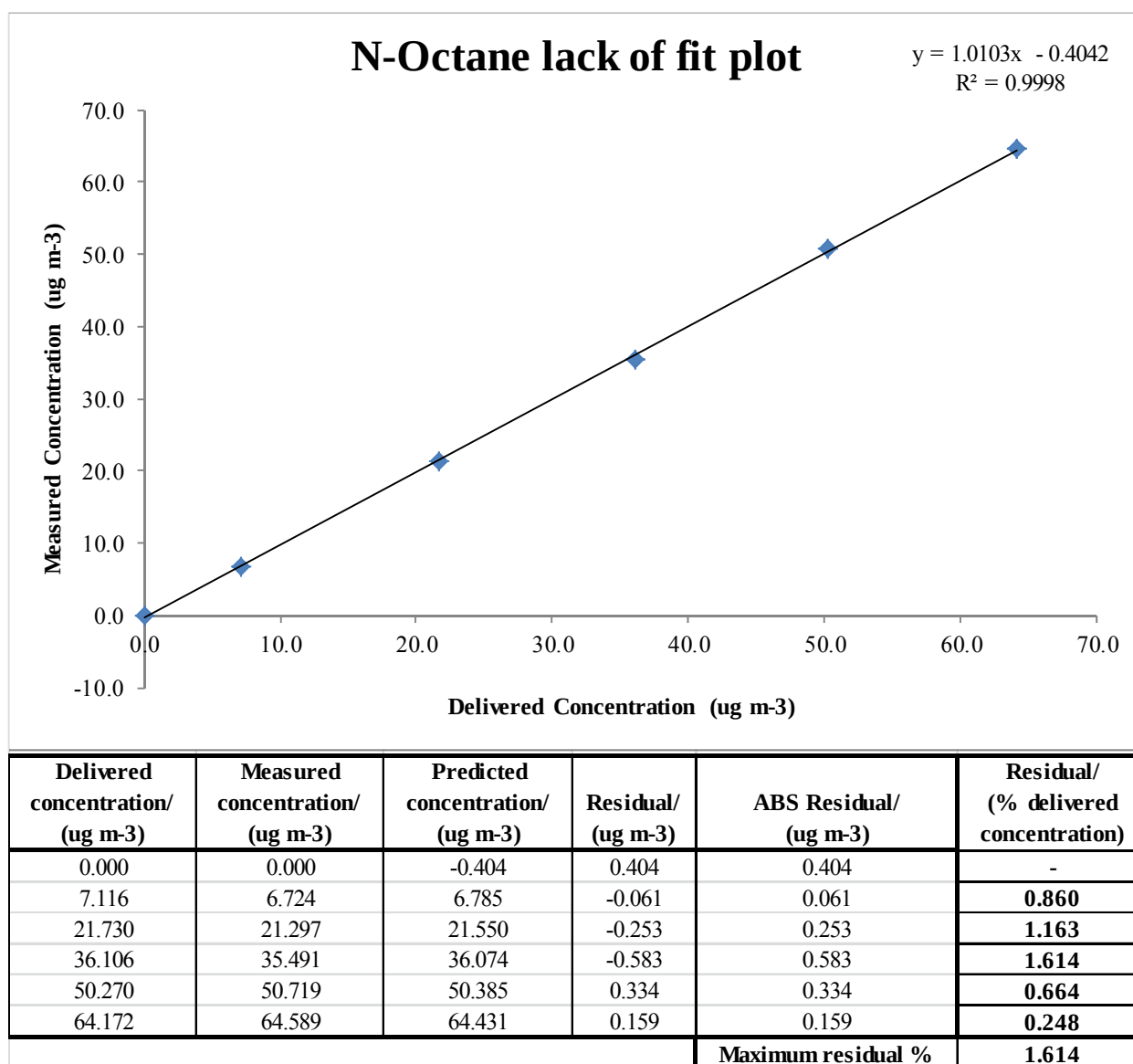


Figure 43: Lack of fit test linear regression for Chromatotec FID 20190309 (N-Octane)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

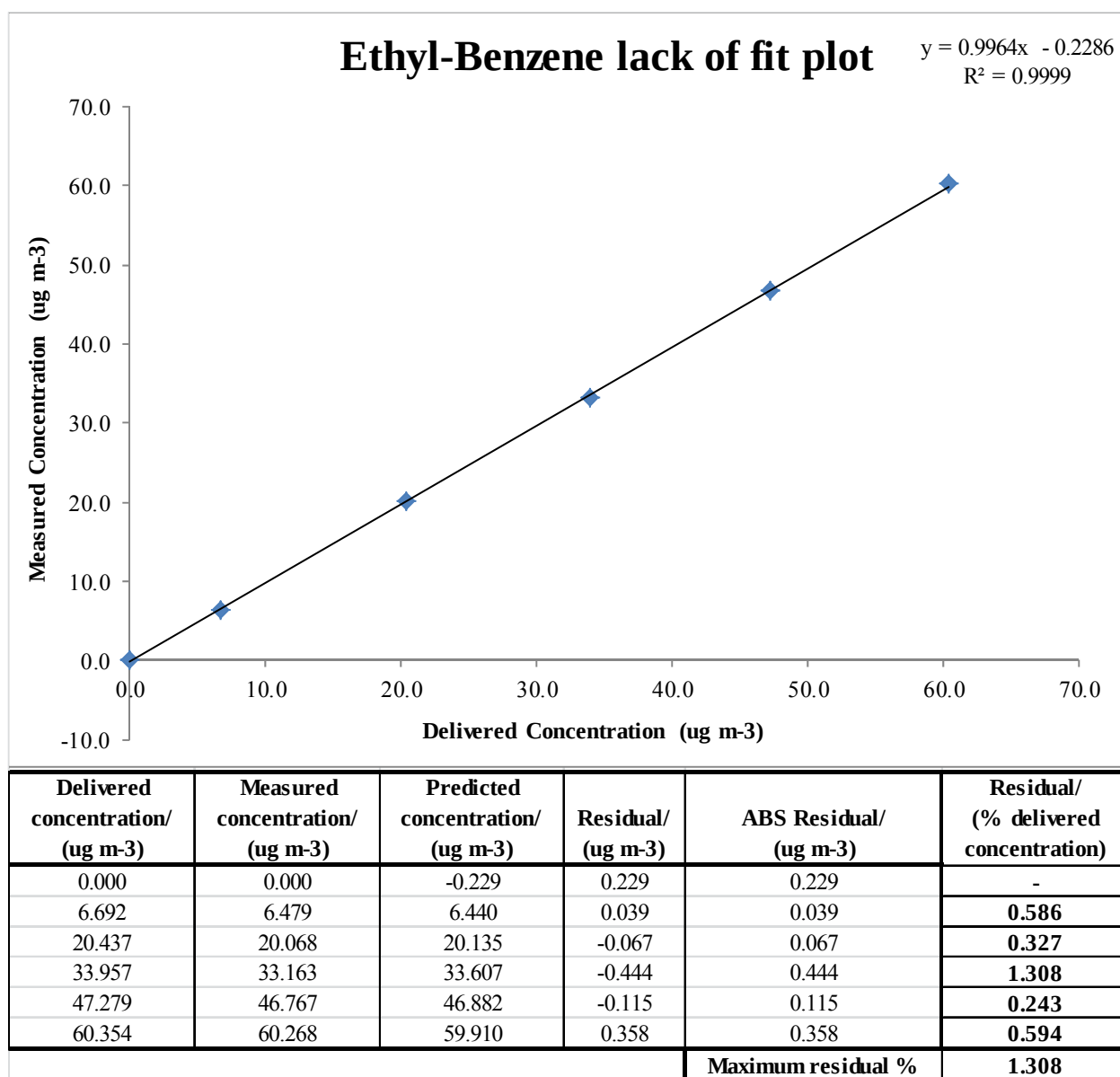


Figure 44: Lack of fit test linear regression for Chromatotec FID 20190309 (Ethyl-Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

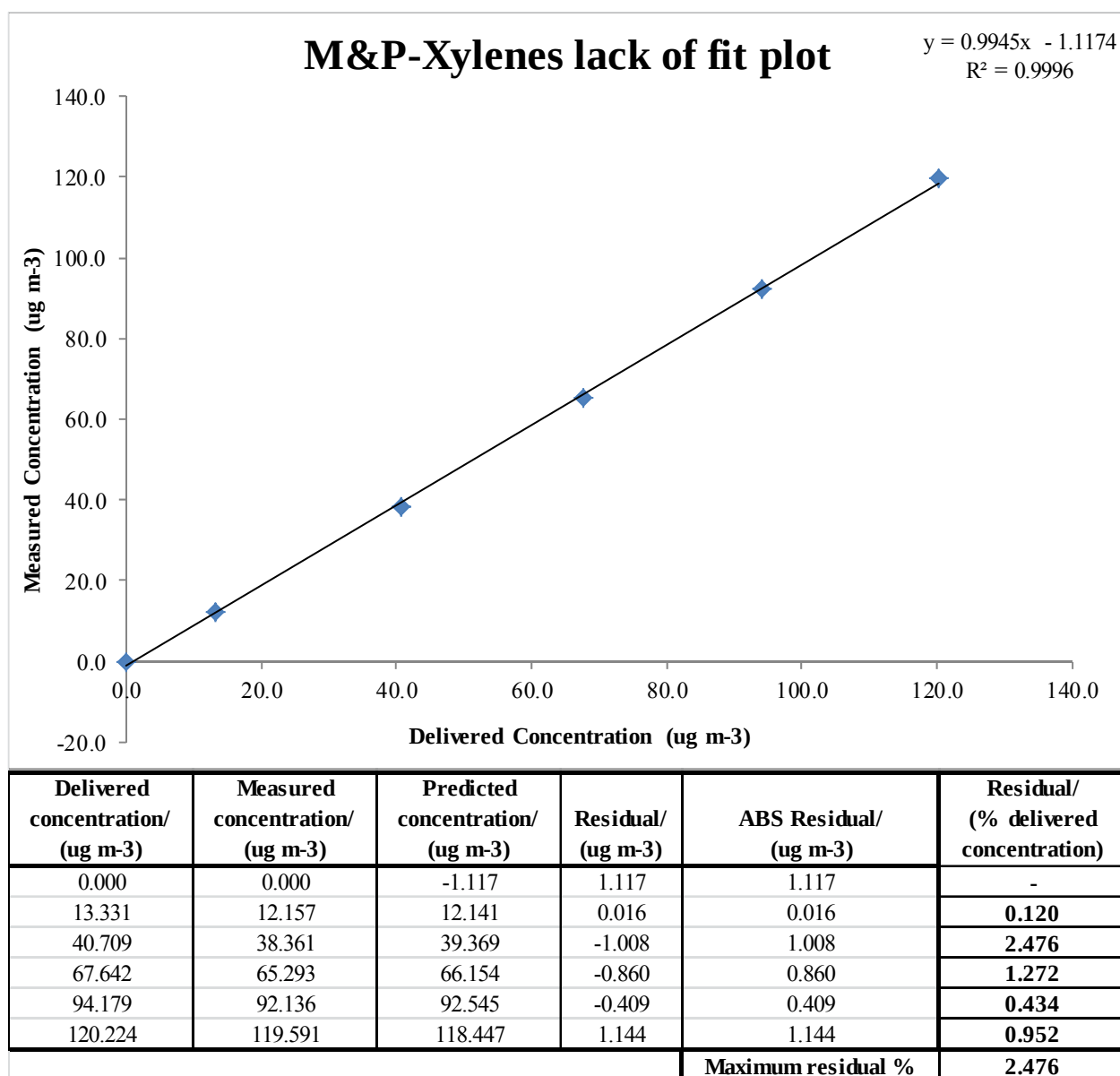


Figure 45: Lack of fit test linear regression for Chromatotec FID 20190309 (M&P-Xylenes)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

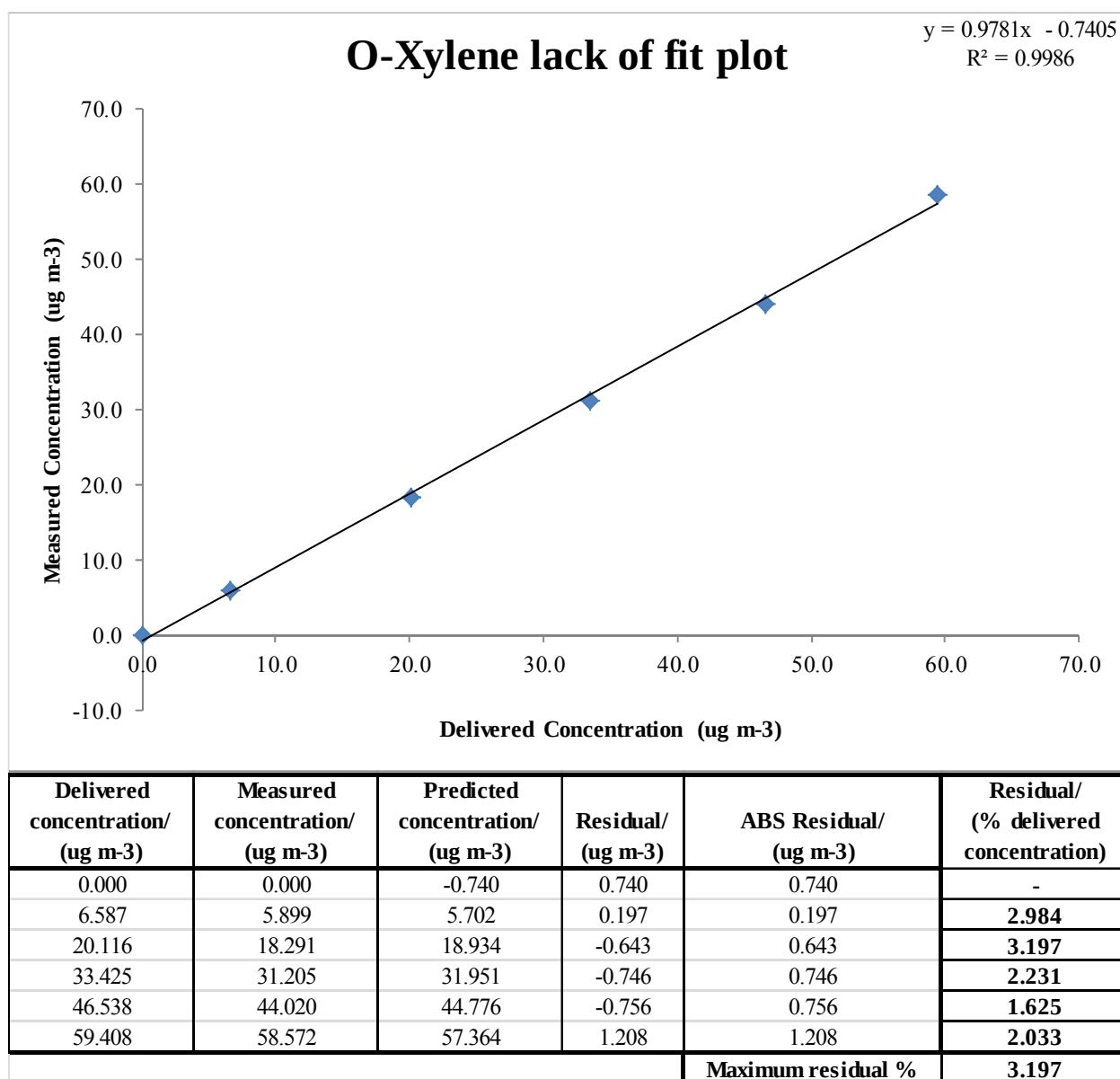


Figure 46: Lack of fit test linear regression for Chromatotec FID 20190309 (O-Xylene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

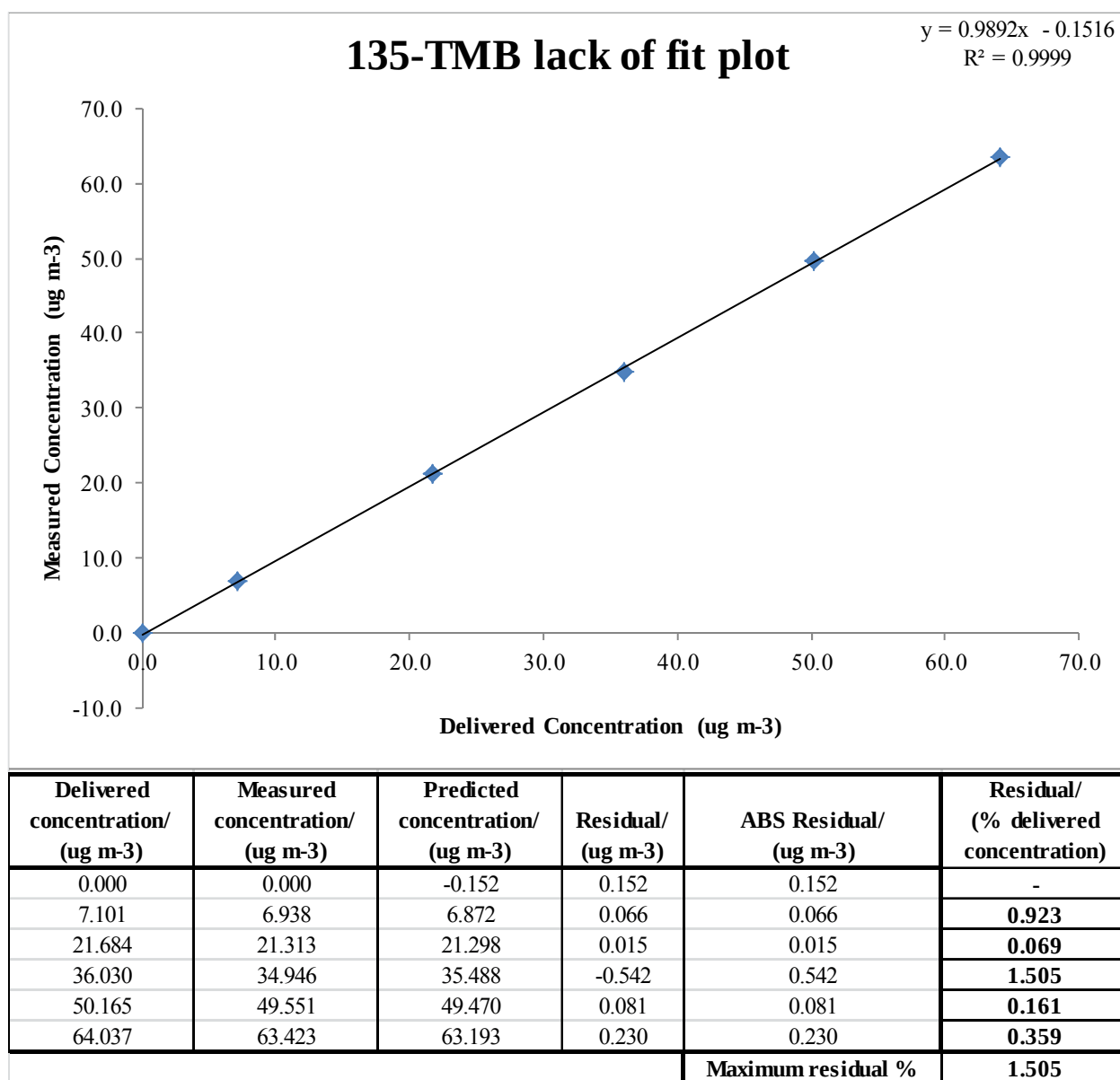


Figure 47: Lack of fit test linear regression for Chromatotec FID 20190309 (1,3,5-TMB)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

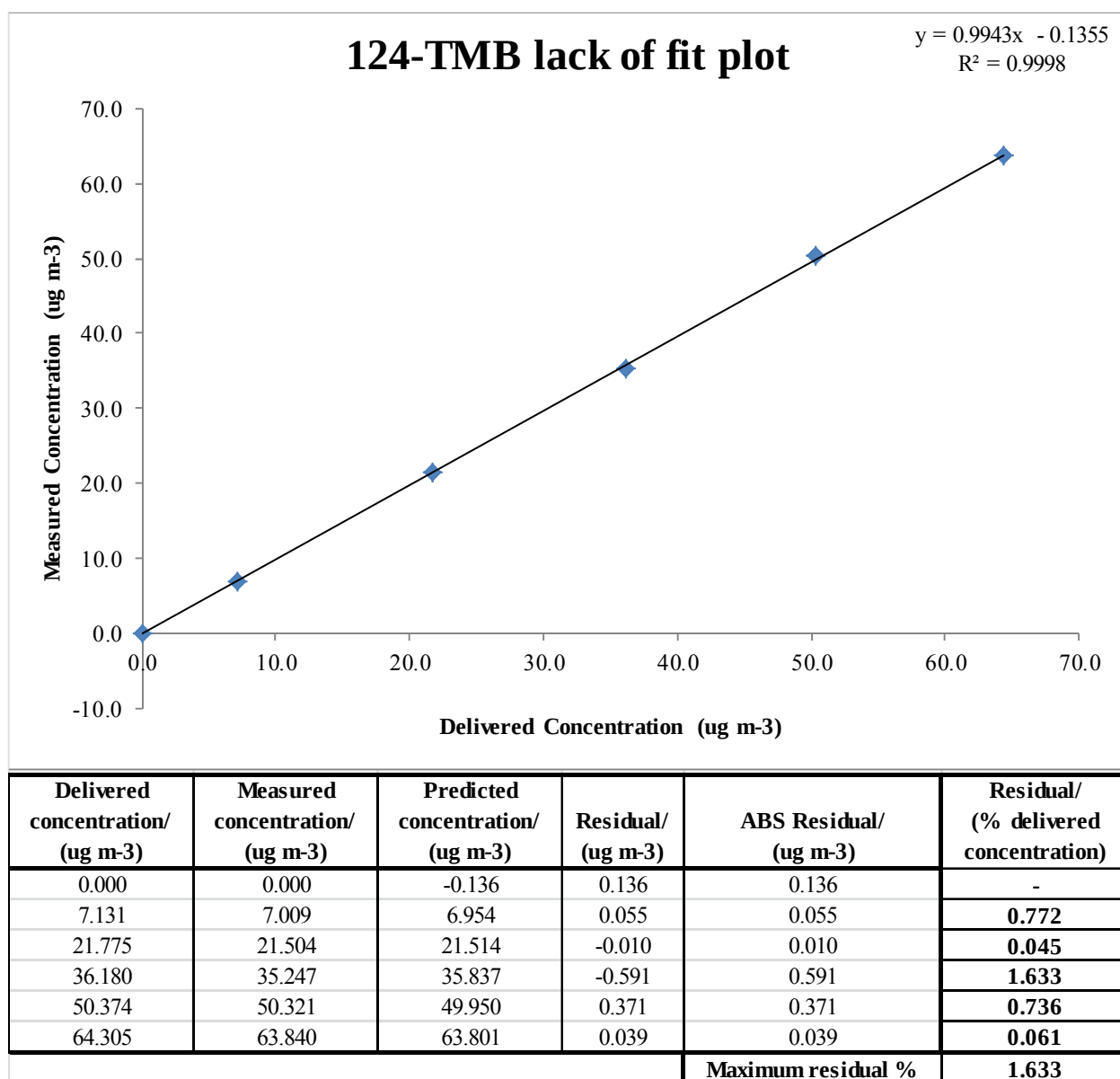


Figure 48: Lack of fit test linear regression for Chromatotec FID 20190309 (1,2,4-TMB)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

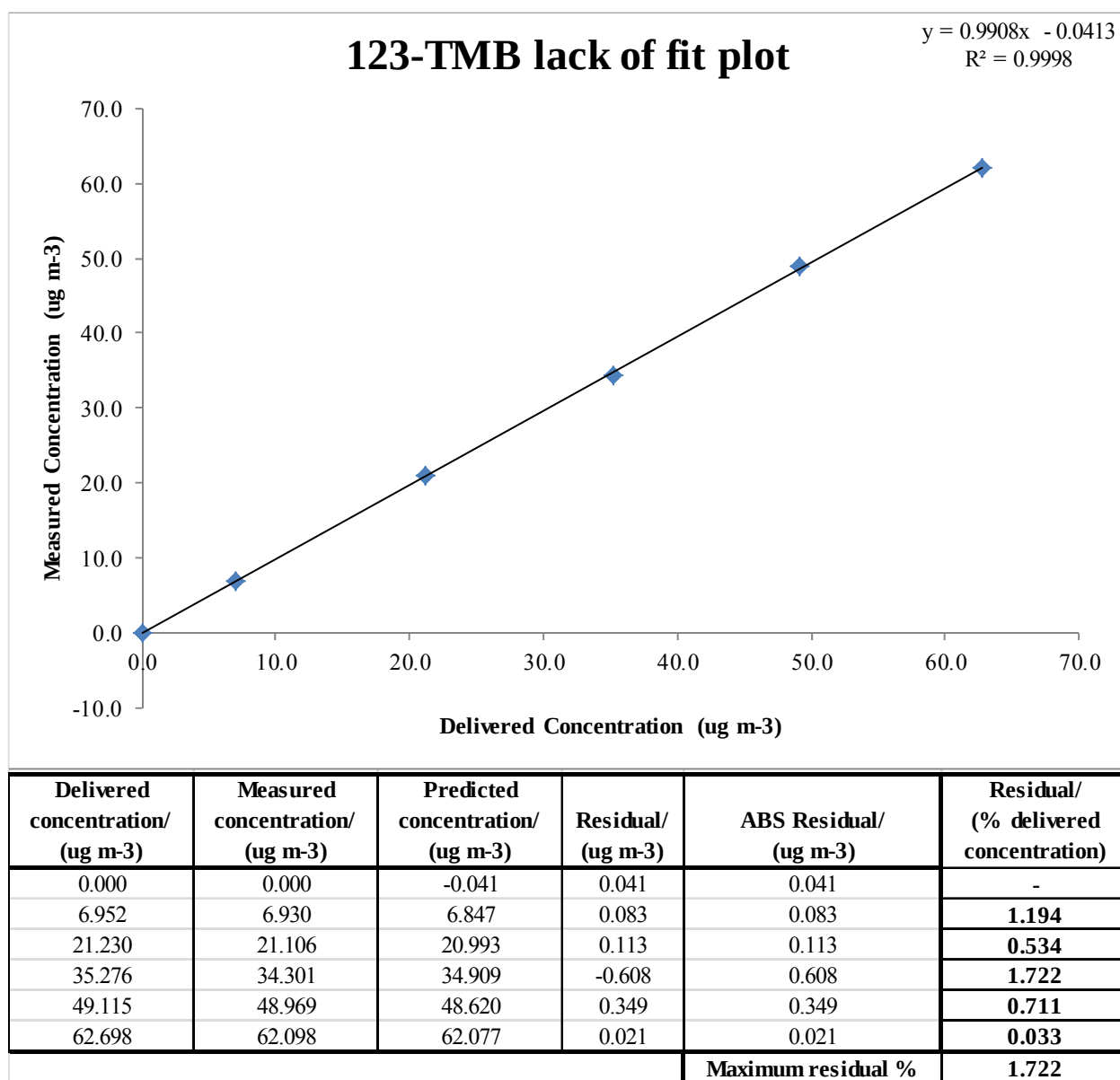


Figure 49: Lack of fit test linear regression for Chromatotec FID 20190309 (1,2,3-TMB)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Chromatotec PID 20430309

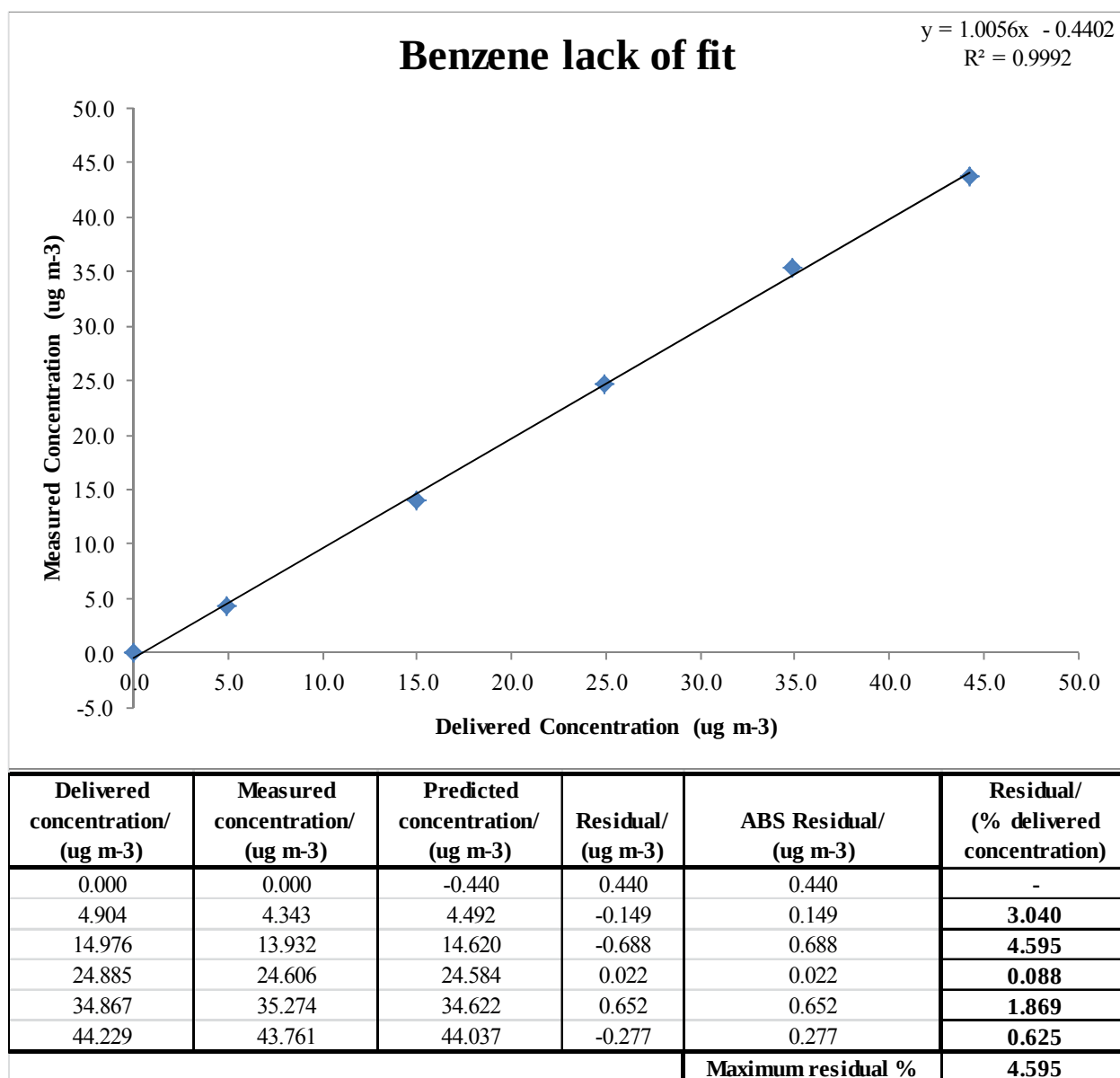


Figure 50: Lack of fit test linear regression for Chromatotec PID 20430309 (Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

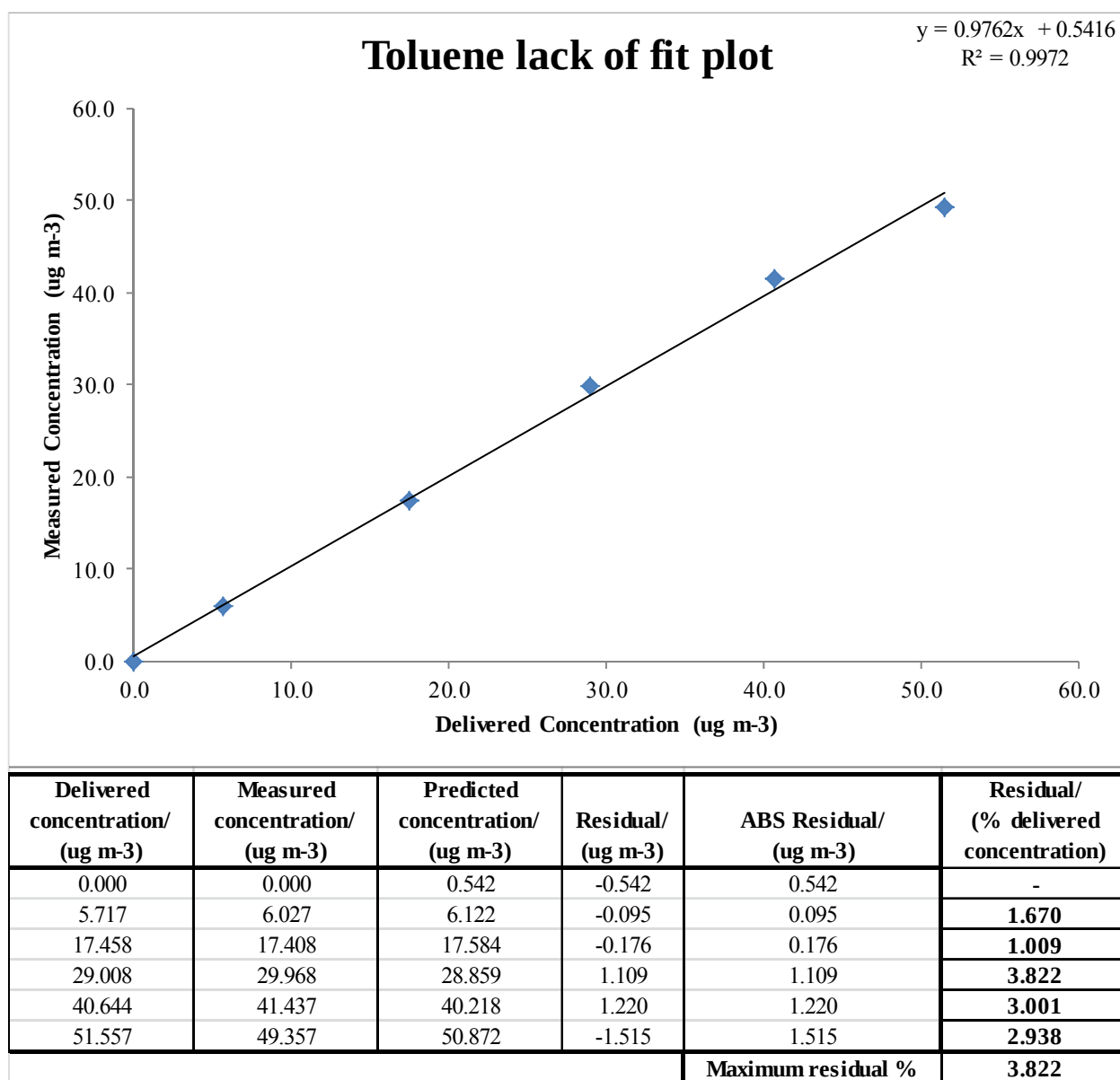


Figure 51: Lack of fit test linear regression for Chromatotec PID 20430309 (Toluene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

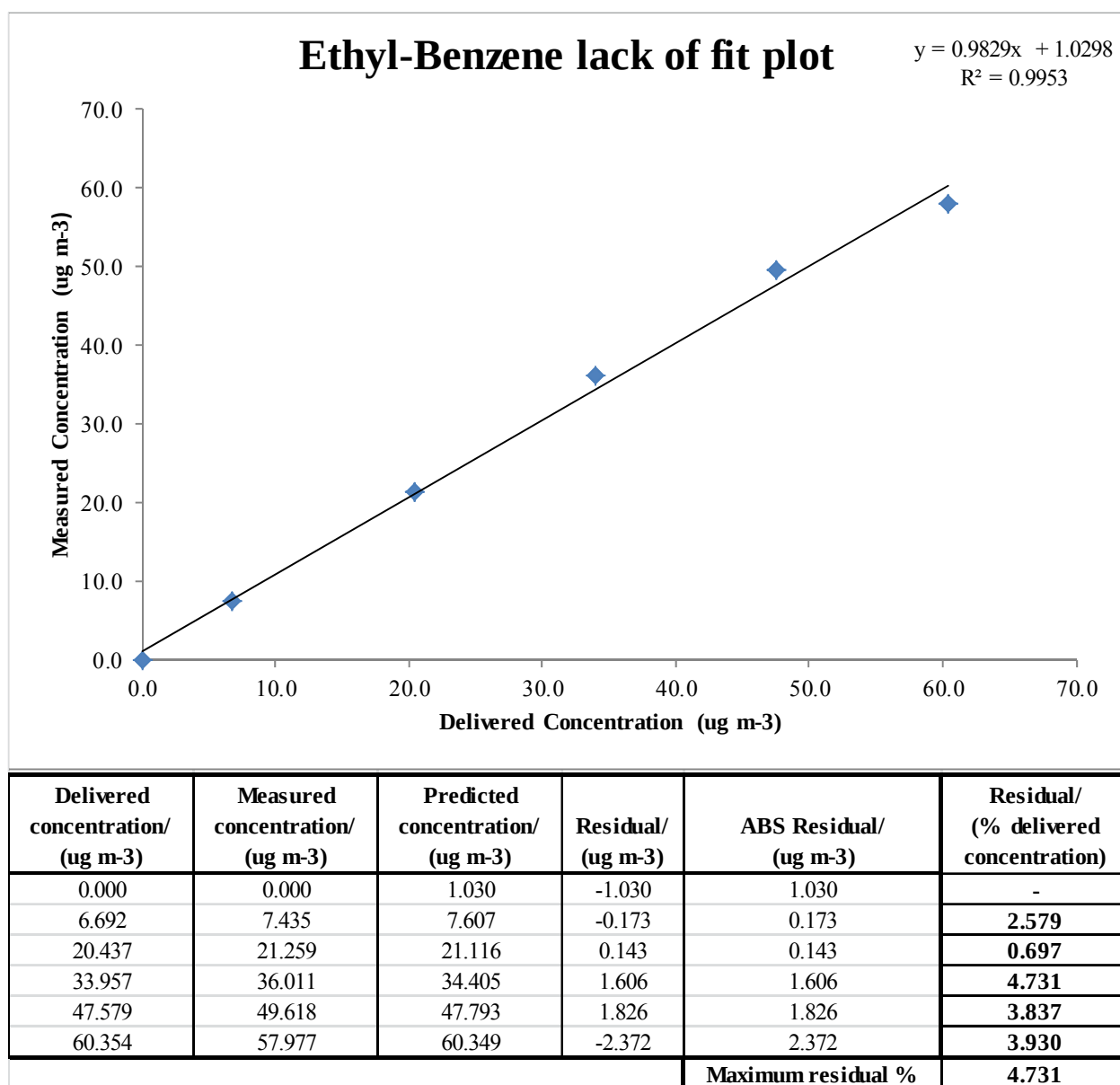


Figure 52: Lack of fit test linear regression for Chromatotec PID 20430309 (Ethyl-Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

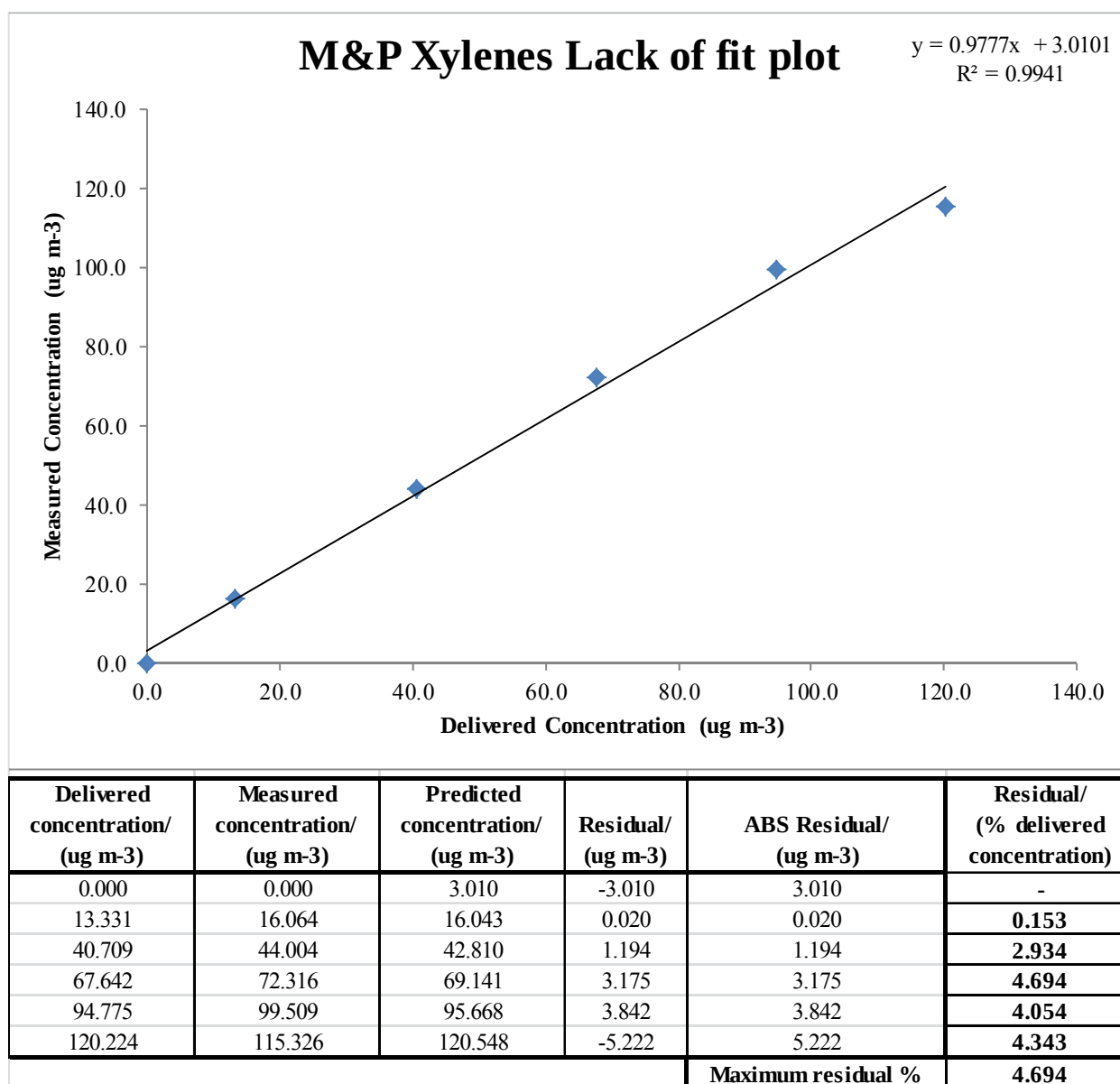


Figure 53: Lack of fit test linear regression for Chromatotec PID 20430309 (M&P-Xylenes)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

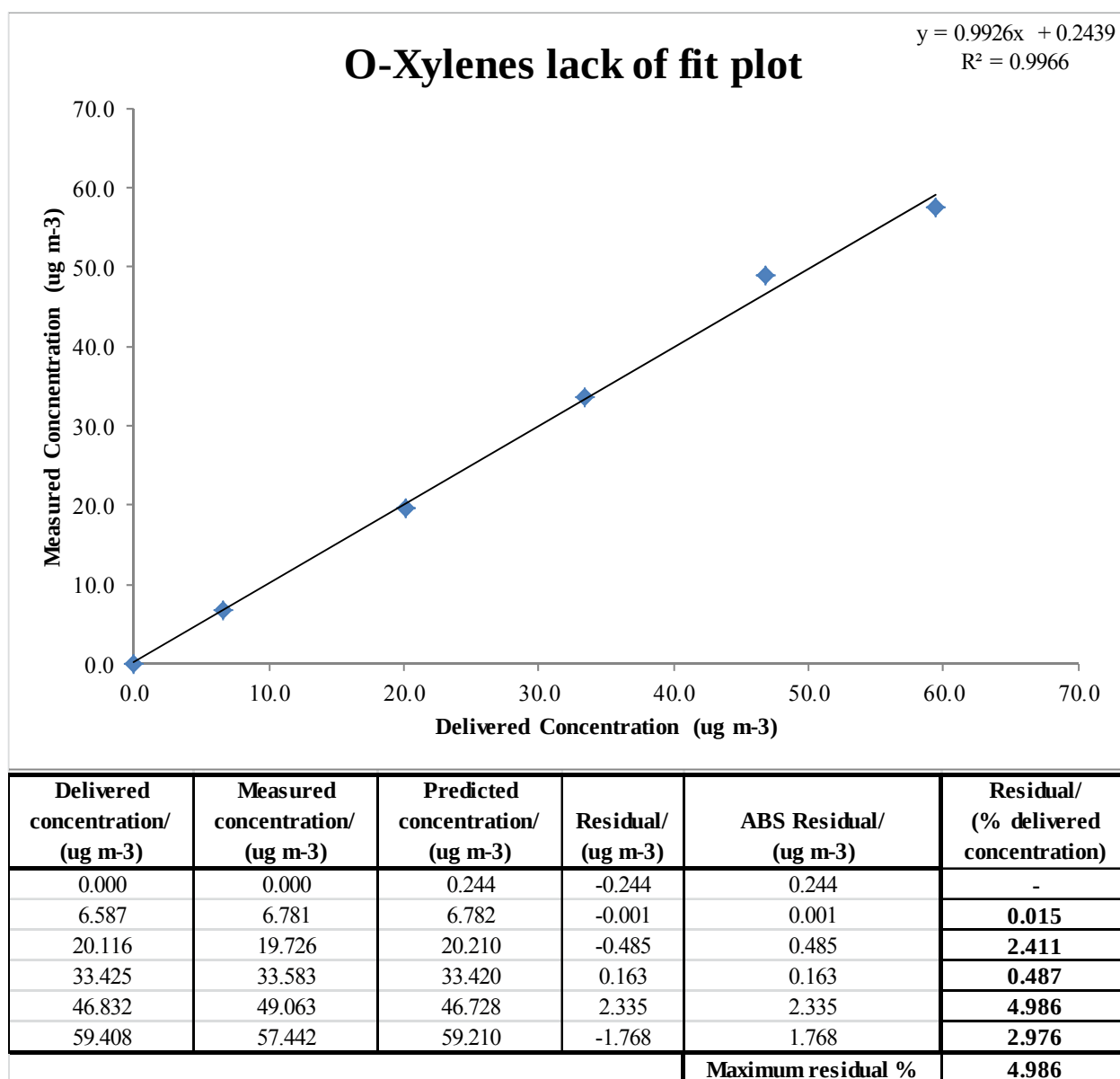


Figure 54: Lack of fit test linear regression for Chromatotec PID 20430309 (O-Xylene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Chromatotec PID 20720509

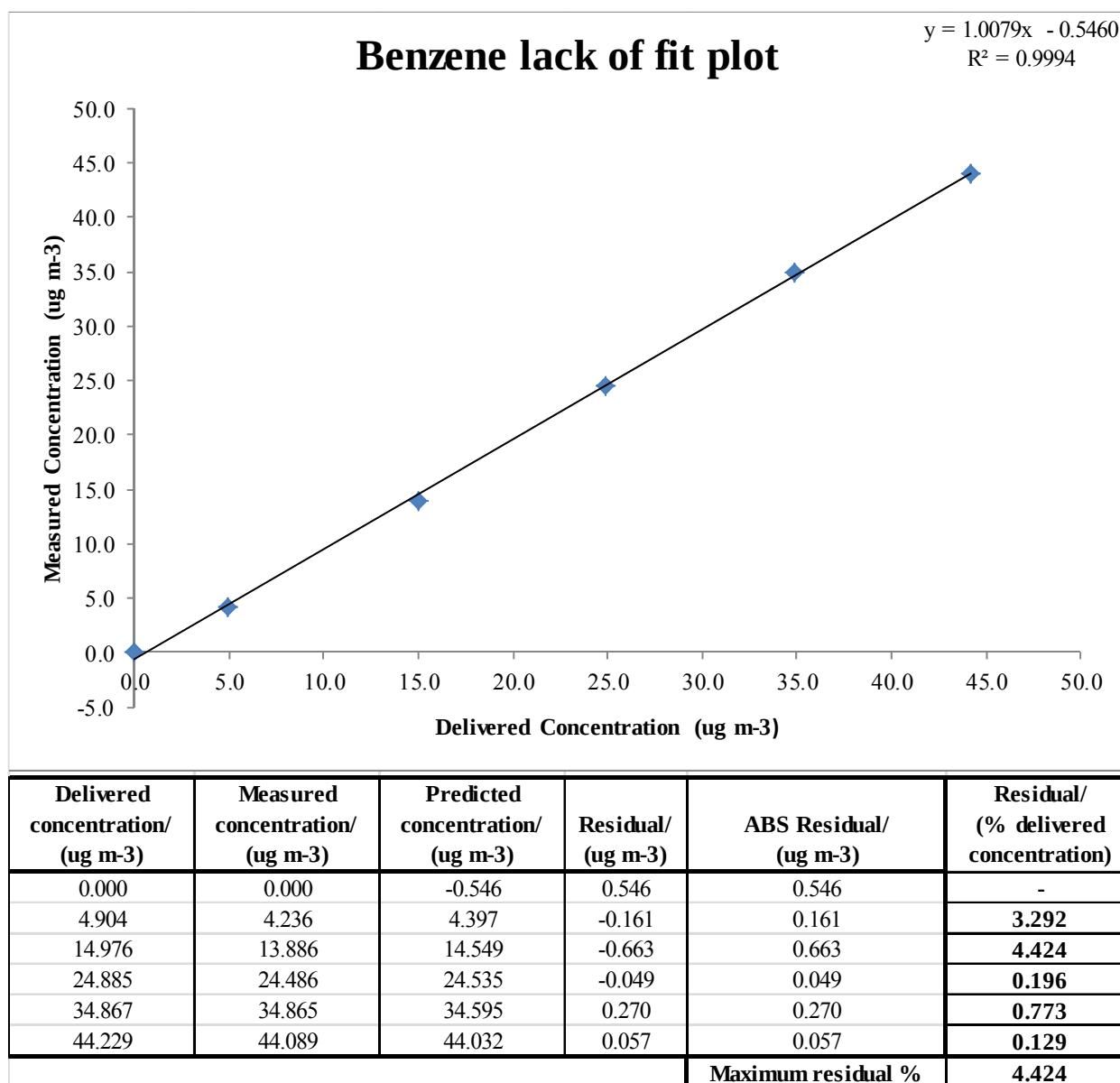


Figure 55: Lack of fit test linear regression for Chromatotec PID 20720509 (Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

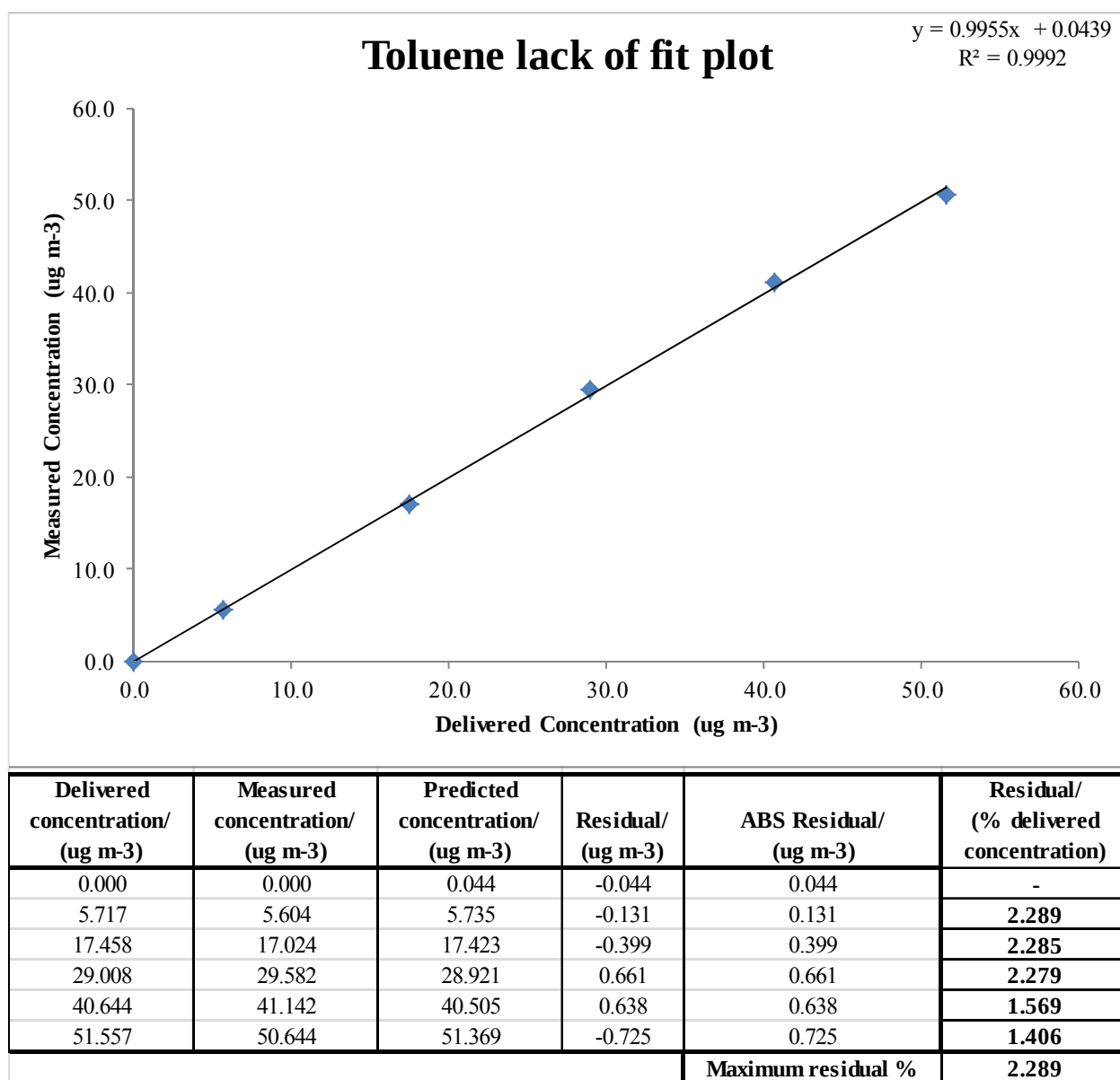


Figure 56: Lack of fit test linear regression for Chromatotec PID 20720509 (Toluene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

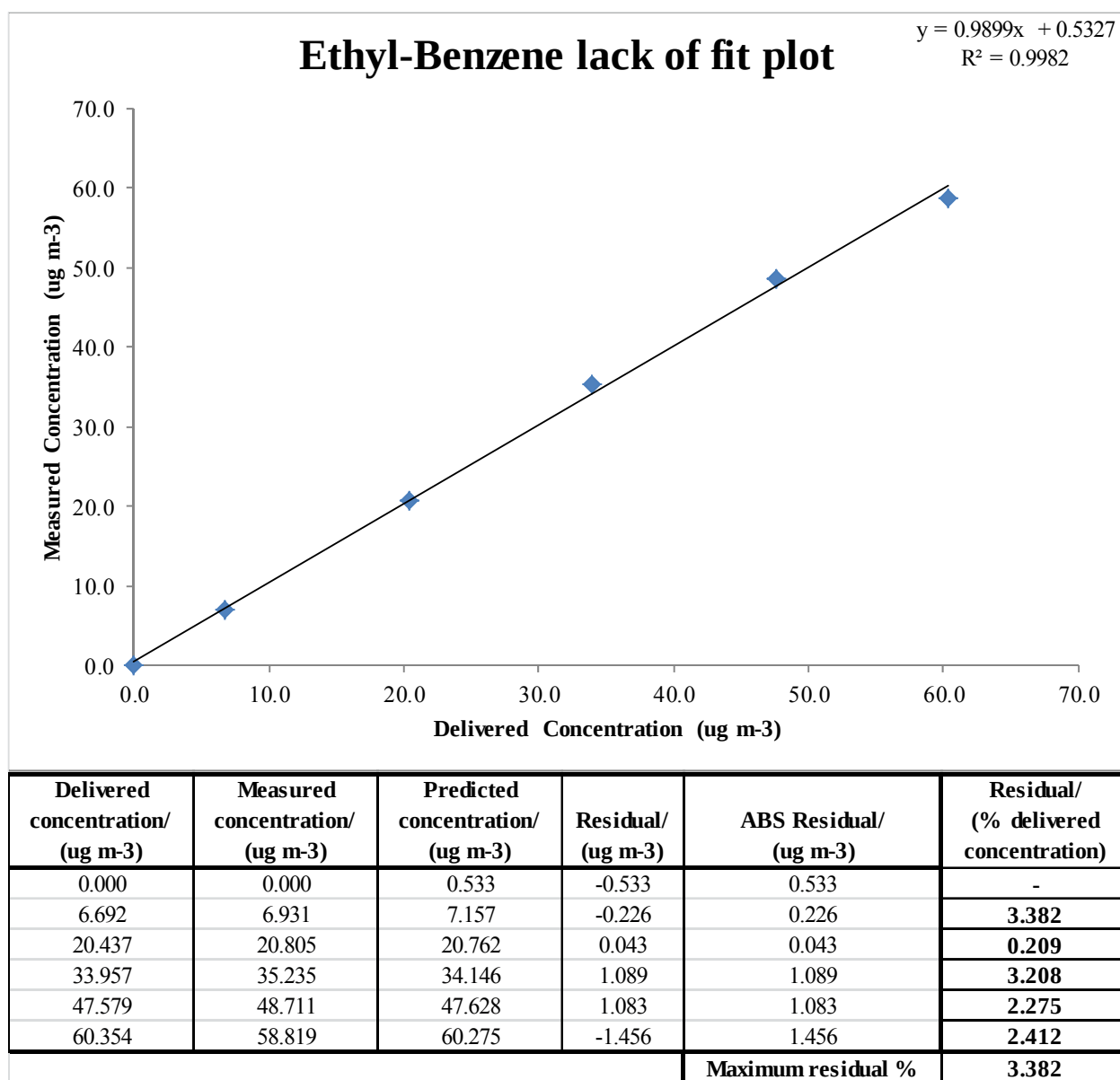


Figure 57: Lack of fit test linear regression for Chromatotec PID 20720509 (Ethyl-Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

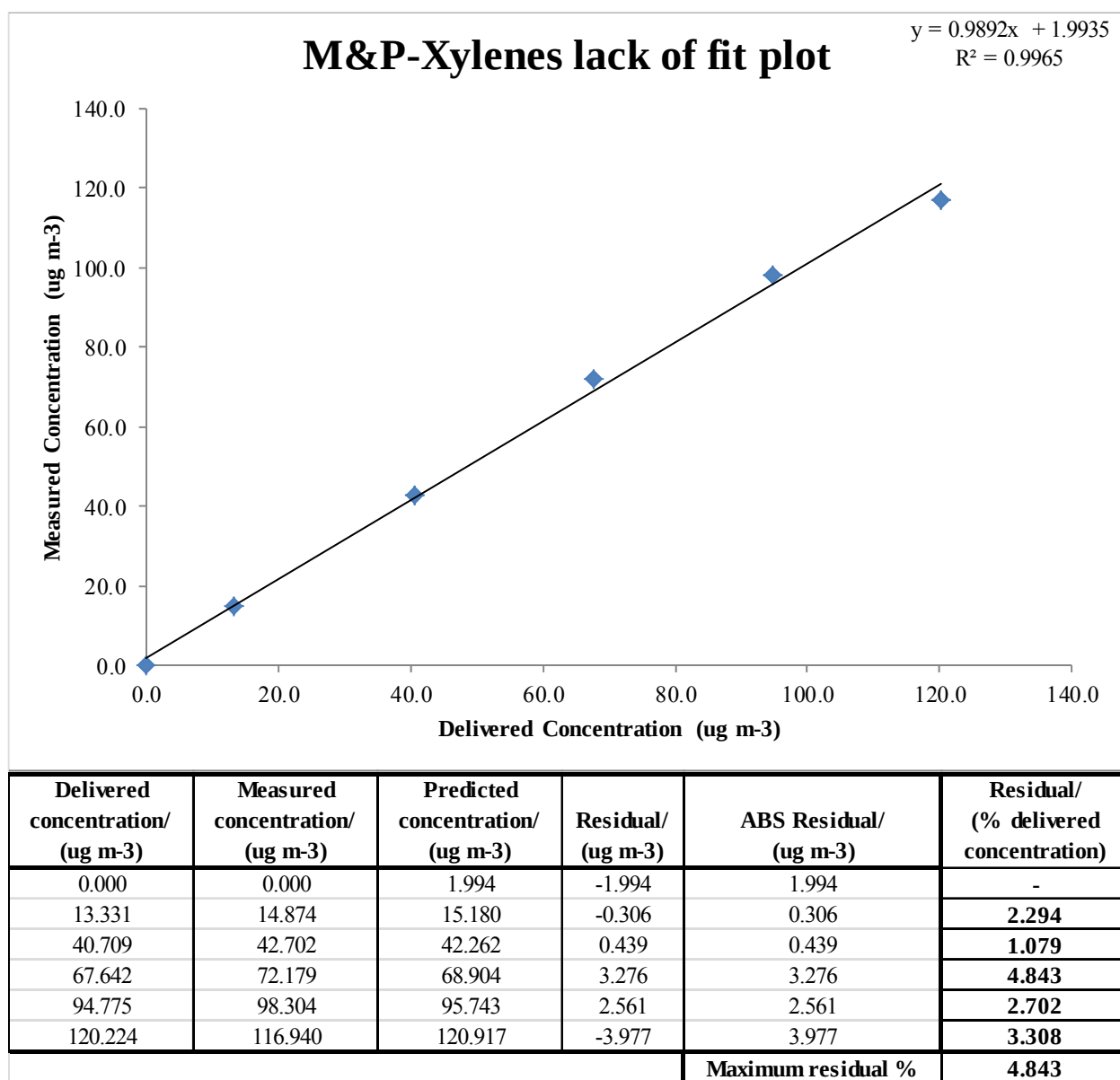


Figure 58: Lack of fit test linear regression for Chromatotec PID 20720509 (M&P-Xylenes)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

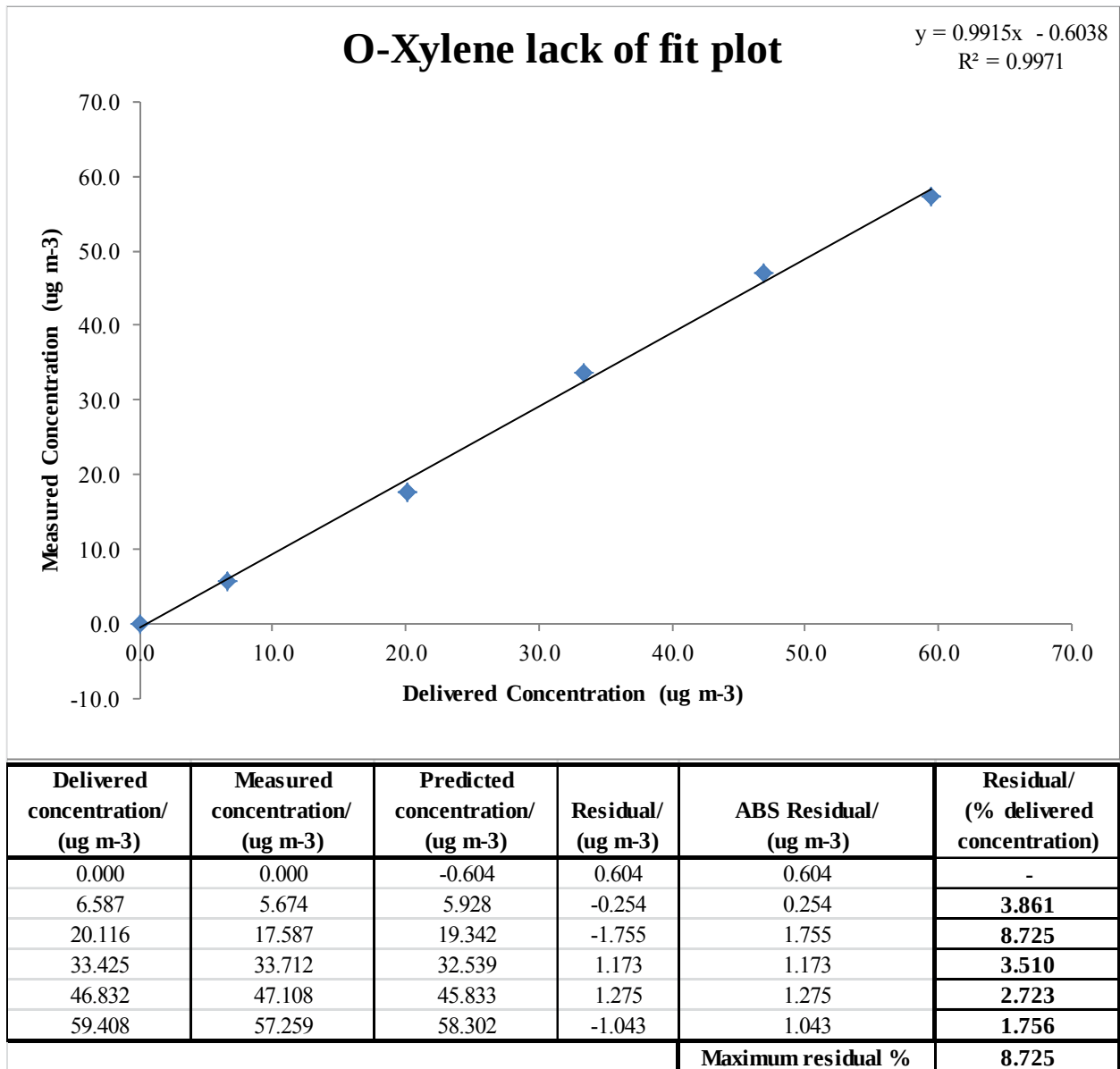


Figure 59: Lack of fit test linear regression for Chromatotec PID 20720509 (O-Xylene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 55: Summary of lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Summary of lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509).						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Performance characteristic $X_L = (d_L)_c = X_{fit}$ Maximum residual/ %	3.75	2.54	1.75	1.93	3.21	3.27
Limit value concentration C_{LV} / ug m-3	5.52	5.00	7.31	6.42	5.90	7.31
Standard Uncertainty $u_{fit, LV}$ /ug m-3	0.119	0.073	0.074	0.072	0.109	0.138

	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
Performance characteristic $X_L = (d_L)_c = X_{fit}$ Maximum residual/ %	2.06	3.03	4.02	2.09	2.26	2.49
Limit value concentration C_{LV} / ug m-3	6.80	13.60	6.80	7.70	7.70	7.70
Standard Uncertainty $u_{fit, LV}$ /ug m-3	0.081	0.238	0.158	0.093	0.100	0.111

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 56: Summary of lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Summary of lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).									
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
Performance characteristic $X_i = (d_i)_c = X_{fit}$ Maximum residual/ %	1.28	2.12	1.62	1.59	4.04	1.61			
Limit value concentration C_{LV} / ug m-3	5.52	5.00	7.31	6.42	5.90	7.31			
Standard Uncertainty $u_{fit, LV}$ /ug m-3	0.041	0.061	0.068	0.059	0.138	0.068			
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
Performance characteristic $X_i = (d_i)_c = X_{fit}$ Maximum residual/ %	1.31	2.48	3.20	1.51	1.63	1.72			
Limit value concentration C_{LV} / ug m-3	6.80	13.60	6.80	7.70	7.70	7.70			
Standard Uncertainty $u_{fit, LV}$ /ug m-3	0.051	0.194	0.126	0.067	0.073	0.077			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 57: Summary of lack of fit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309)

Summary of lack of fit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309).					
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Performance characteristic $X_i = (d_i)_c = X_{fit}$ Maximum residual/ %	4.59	3.82	4.73	4.69	4.99
Limit value concentration C_{LV} / ug m-3	5.00	5.90	6.80	13.60	6.80
Standard Uncertainty $u_{fit, LV}$ /ug m-3	0.133	0.130	0.186	0.369	0.196

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 58: Summary of lack of fit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

Summary of lack of fit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).					
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Performance characteristic $X_L = (d_r)_c = X_{fit}$ Maximum residual/ %	4.42	2.29	3.38	4.84	8.72
Limit value concentration C_{LV} / ug m-3	5.00	5.90	6.80	13.60	6.80
Standard Uncertainty $u_{fit, LV}$ /ug m-3	0.128	0.078	0.133	0.380	0.343

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.4.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene

Additional performance criterion **not met** for the determinands: o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.5 Carry-over (memory effect) (B5)

5.5.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Carry over, Y, the second analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 10 % of the limit value, ie, $0.5 \mu\text{g m}^{-3}$ (0.15 ppb).

5.5.2 Additional requirements

The first analysis of zero air immediately following analysis of the highest concentration of benzene required for the linearity test shall not exceed a measured benzene concentration of 20 % of the limit value, ie, $1 \mu\text{g m}^{-3}$ (0.30 ppb).

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

All other determinands involved in the test should not exceed a concentration of 0.30 ppb after the first injection and 0.15 ppb after the second injection.

5.5.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs.

5.5.4 Testing

This test was **required** to be carried out immediately **after the lack of fit test (B5)**. Valid samples of zero gas were introduced into the CAMs. The CAMs sampled ambient air after the test was completed.

5.5.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

5.5.6 Results

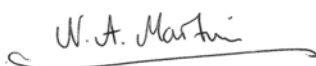
The results taken were analysed to ensure that the measured concentration of benzene did not exceed $1 \mu\text{g m}^{-3}$ (0.31 ppb) after the first valid sample and did not exceed $0.5 \mu\text{g m}^{-3}$ (0.15 ppb) after the second valid sample. Only the second test result (0.15 ppb) was required to be passed for the MCERTS criterion.

The results obtained from the first injection of sample gas were not counted. **The second injection was treated as the first valid sample.**

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309,
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The results of all other determinands involved in the tests were checked to ensure that they did not exceed a concentration of 0.31 ppb after the first valid sample injection, and did not exceed 0.15 ppb after the second valid sample. Again, only the second test result (0.15 ppb) was required to be passed for the MCERTS criterion.

Tables 59, 60, 61 and 62 summarise the results for the memory effect test for all four CAMs.

Table 59: Carry-over (memory effect) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Carry-over (memory effect) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
07/05/2010 14:46	0.22	0.44	0.19	0.46	1.35	1.33
07/05/2010 15:16	0.00	0.41	0.00	0.28	0.96	0.71

ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
07/05/2010 14:46	2.07	5.07	3.15	7.59	10.40	12.00
07/05/2010 15:16	1.19	2.93	1.76	2.98	5.83	6.30

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Carry-over (memory effect) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
ug m-3		N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
07/05/2010	14:46	0.25	0.43	0.27	0.44	1.23	1.13		
07/05/2010	15:16	0.20	0.36	0.22	0.30	1.03	0.67		

Carry-over (memory effect) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).							
ug m-3		ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
07/05/2010	14:46	1.95	4.80	2.97	7.21	9.69	11.71
07/05/2010	15:16	1.12	2.80	1.45	3.20	5.15	6.15

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 61: Carry-over (memory effect) test results for Chromatotec GC 866 PID airtoxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Carry-over (memory effect) test results for Chromatotec GC 866 PID airtoxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
07/05/2010 14:46		0.42	1.50	1.90	5.75	2.30
07/05/2010 15:16		0.35	1.30	1.29	4.02	1.51

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 62: Carry-over (memory effect) test results for Chromatotec GC 866 PID airtoxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Carry-over (memory effect) test results for Chromatotec GC 866 PID airtoxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
ug m ⁻³	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
	07/05/2010 14:46	1.50	1.90	5.75	2.30	
	07/05/2010 15:16	1.30	1.29	4.02	1.51	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.5.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane, 2,2,4-trimethyl pentane; n-heptane, n-octane

Additional performance criterion **not met** for the determinands: toluene; ethyl-benzene; m-xylene; p-xylene, o-xylene, 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane, 2,2,4-trimethyl pentane; n-heptane; n-octane

Additional performance criterion **not met** for the determinands: toluene; ethyl-benzene; m-xylene; p-xylene, o-xylene, 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **not met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **not met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.6 Dependence on voltage (B6)

5.6.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Sensitivity coefficient for the influence of the voltage at the span concentration value (between 70 % and 90 % of the certification range) of benzene,

$$b_v < 0.2 \% V^{-1}$$

5.6.2 Additional requirements

Determine sensitivity coefficient for the influence of the voltage at 1/10 of the annual mean concentration limit value for benzene.

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.6.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs, isolating transformer supplying a voltage controlling in the range 220 V to 240 V, digital multimeter.

5.6.4 Testing

This test was carried out at 1/10 of the limit value of benzene, namely $0.5 \mu\text{g m}^{-3}$ (0.15 ppb) and at the span value (between 70% and 90% of certification range), namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test employed known concentrations of nominally 0.15 ppb and 13.9 ppb at each voltage. A total of 5 determinand sample injections were carried out at for each voltage. The first sample result was rejected in each case.

The test was carried out at the minimum and maximum of the voltage range specified by the manufacturer, **220 V**, and **240 V**. The CAMs sampled ambient air before and after the test.

5.6.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

5.6.6 Results

Four individual measurements at each voltage level and concentration were employed in the calculations.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The uncertainty from voltage dependence u_V was calculated from:

$$u_V = \frac{b_v \cdot |\Delta V|}{2\sqrt{3}}$$

where the sensitivity coefficient, b_v , (($\mu\text{g m}^{-3}$)/V) is given by

$$b_v = \frac{|c_{v\max} - c_{v\min}|}{\Delta V}$$

and

$c_{v\max}$ is the average of the individual measurement at maximum voltage $V_{\max}$;

$c_{v\min}$ is the average of the individual measurement at minimum voltage $V_{\min}$;

$$\Delta V = V_{\max} - V_{\min}$$

In the present standard, the performance criterion is expressed as a percentage, then the test value shall be calculated from $100u/C$, where u is the uncertainty component in $\mu\text{g m}^{-3}$, and C is the highest concentration used in the test.

The standard is currently being reviewed, since in certain tests, the performance criteria are ambiguous.

Certain “accredited” laboratories have made the interpretation defining the performance criterion, K as:

$$K = \frac{u_v \cdot 100}{C \cdot \Delta V}$$

where C is the highest concentration used in the test.

An alternative interpretation is also included based on the sensitivity coefficient.

The sensitivity coefficient expressed as a percentage per volt is given by:

$$b_v = \frac{|c_{v\max} - c_{v\min}|}{c_{v\max}} \cdot \frac{100\%}{\Delta V}$$

Tables 63, 64, 65 and 66 summarise the results for the voltage test for all four CAMs carried out at the span concentration.

Tables 67, 68, 69 and 70 summarise the results for the voltage test for all four CAMs carried out at $1/10^{\text{th}}$ the limit concentration.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 63: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
220 V	09/05/2011 10:09	48.89	44.48	65.20	56.30	50.62	62.20		
	09/05/2011 10:39	48.91	44.71	65.49	56.35	51.52	64.21		
	09/05/2011 11:09	49.22	44.87	65.42	56.52	51.76	64.64		
	09/05/2011 11:39	49.06	44.70	65.40	56.49	51.35	64.61		
	09/05/2011 12:09	49.02	44.71	65.10	56.40	51.57	64.29		
	09/05/2011 12:39	48.78	44.51	64.96	56.07	51.22	64.32		
	MEAN / ug m-3	49.02	44.70	65.22	56.37	51.48	64.46		
240 V	09/05/2011 13:39	48.84	44.59	65.40	56.52	51.12	64.37		
	09/05/2011 14:09	49.17	44.74	65.42	56.36	51.76	64.70		
	09/05/2011 14:39	49.09	44.64	65.28	56.65	51.47	64.70		
	09/05/2011 15:09	49.12	44.55	65.11	56.47	51.32	64.52		
	09/05/2011 15:39	48.88	44.10	65.01	56.35	51.10	64.34		
	09/05/2011 16:09	48.68	44.35	64.93	55.88	51.70	64.30		
	MEAN / ug m-3	48.94	44.41	65.08	56.34	51.40	64.46		
	K (% / V)	0.0024	0.010	0.0031	0.00086	0.0023	0.00002		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 63 (continued): Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.										
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
220 V	09/05/2011 10:09	57.16	112.75	55.47	55.79	53.64	51.08			
	09/05/2011 10:39	59.76	118.76	58.59	61.28	60.29	57.99			
	09/05/2011 11:09	60.24	119.85	59.21	62.82	62.21	60.06			
	09/05/2011 11:39	60.46	120.29	59.47	63.64	63.25	61.29			
	09/05/2011 12:09	60.32	120.36	59.30	63.65	63.41	61.52			
	09/05/2011 12:39	60.29	120.18	59.37	63.80	63.73	61.86			
	MEAN / ug m-3	60.33	120.17	59.34	63.48	63.15	61.18			
240 V	09/05/2011 13:39	59.51	118.51	58.60	62.49	62.30	60.24			
	09/05/2011 14:09	60.49	120.71	59.72	64.07	64.01	62.26			
	09/05/2011 14:39	60.51	120.76	59.72	64.47	64.37	62.54			
	09/05/2011 15:09	60.49	120.76	59.75	64.30	64.57	62.77			
	09/05/2011 15:39	60.45	120.59	59.70	64.42	64.50	62.81			
	09/05/2011 16:09	60.45	120.60	59.65	64.34	64.55	62.89			
	MEAN / ug m-3	60.47	120.68	59.71	64.38	64.50	62.76			
	K (% / V)	0.0035	0.0062	0.0092	0.021	0.031	0.037			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 64: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
220 V	09/05/2011 10:09	49.64	44.92	66.14	56.58	51.51	64.02		
	09/05/2011 10:39	49.83	45.15	66.51	57.15	52.43	65.34		
	09/05/2011 11:09	49.81	45.20	66.42	57.10	52.57	65.57		
	09/05/2011 11:39	49.69	45.15	66.21	56.84	52.52	65.47		
	09/05/2011 12:09	49.58	45.00	66.18	56.87	52.47	65.25		
	09/05/2011 12:39	49.29	44.95	66.03	56.78	52.32	65.37		
	MEAN / ug m-3	49.60	45.07	66.21	56.90	52.47	65.42		
240 V	09/05/2011 13:39	49.14	44.54	65.45	56.37	51.68	64.32		
	09/05/2011 14:09	49.16	44.64	65.41	56.25	51.97	64.73		
	09/05/2011 14:39	48.94	44.51	65.34	56.12	51.89	64.61		
	09/05/2011 15:09	49.03	44.50	65.14	55.97	51.84	64.63		
	09/05/2011 15:39	48.70	44.34	65.09	56.13	51.69	64.40		
	09/05/2011 16:09	48.68	44.35	64.93	55.88	51.70	64.30		
	MEAN / ug m-3	48.84	44.43	65.12	56.03	51.78	64.49		
	K (% / V)	0.023	0.022	0.025	0.023	0.020	0.021		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 64 (continued): Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.										
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
220 V	09/05/2011 10:09	58.25	112.59	52.46	57.07	55.11	52.64			
	09/05/2011 10:39	60.57	120.45	59.42	62.29	61.09	59.16			
	09/05/2011 11:09	61.03	121.74	60.08	63.73	62.99	61.23			
	09/05/2011 11:39	61.24	121.96	60.25	64.43	64.24	62.43			
	09/05/2011 12:09	61.03	121.86	60.17	64.27	64.12	62.24			
	09/05/2011 12:39	61.00	122.01	60.27	64.52	64.46	62.64			
	MEAN / ug m-3	61.07	121.89	60.19	64.24	63.95	62.14			
240 V	09/05/2011 13:39	59.75	119.23	58.76	62.30	62.07	60.26			
	09/05/2011 14:09	60.70	120.95	59.76	64.14	64.17	62.50			
	09/05/2011 14:39	60.47	120.88	59.68	64.06	64.10	62.39			
	09/05/2011 15:09	60.62	120.94	59.74	64.39	64.52	62.88			
	09/05/2011 15:39	60.33	120.67	59.57	64.06	64.17	62.49			
	09/05/2011 16:09	60.45	120.60	59.65	64.34	64.55	62.89			
	MEAN / ug m-3	60.47	120.77	59.66	64.21	64.34	62.67			
	K (% / V)	0.015	0.014	0.013	0.00053	0.0088	0.012			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 65: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.							
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
220 V	09/05/2011 10:09	45.56	44.16	44.02	87.46	43.76	
	09/05/2011 10:39	43.77	42.87	43.32	86.39	42.81	
	09/05/2011 11:09	45.75	45.12	45.69	90.94	45.31	
	09/05/2011 11:39	43.01	42.33	43.00	85.89	42.61	
	09/05/2011 12:09	45.39	44.57	45.26	90.45	44.90	
	09/05/2011 12:39	43.30	42.71	43.14	86.34	42.85	
	MEAN / ug m-3	44.36	43.68	44.27	88.40	43.92	
240 V	09/05/2011 13:39	42.24	41.44	41.99	83.83	41.48	
	09/05/2011 14:09	44.68	44.11	44.60	89.13	44.35	
	09/05/2011 14:39	42.58	41.86	42.76	85.52	42.40	
	09/05/2011 15:09	44.60	44.18	44.76	89.57	44.45	
	09/05/2011 15:39	42.16	41.61	42.15	84.51	41.71	
	09/05/2011 16:09	44.35	43.83	44.47	88.74	43.89	
	MEAN / ug m-3	43.42	42.87	43.54	87.08	43.11	
	K (% / V)	0.031	0.027	0.025	0.022	0.027	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 66: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.							
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
220 V	09/05/2011 10:09	44.45	43.17	42.96	84.98	42.48	
	09/05/2011 10:39	44.32	43.38	43.78	86.77	43.72	
	09/05/2011 11:09	45.44	44.57	45.25	89.95	45.38	
	09/05/2011 11:39	43.92	43.23	43.79	87.02	43.80	
	09/05/2011 12:09	44.70	44.31	45.08	89.64	44.34	
	09/05/2011 12:39	44.10	43.43	43.89	87.44	43.25	
	MEAN / ug m-3	44.54	43.88	44.50	88.51	44.19	
240 V	09/05/2011 13:39	43.25	42.28	42.70	85.13	41.96	
	09/05/2011 14:09	44.60	43.96	44.55	88.75	44.69	
	09/05/2011 14:39	43.45	42.81	43.52	86.68	42.79	
	09/05/2011 15:09	43.94	43.92	44.67	89.12	44.03	
	09/05/2011 15:39	43.22	42.59	43.17	86.04	43.17	
	09/05/2011 16:09	44.35	43.83	44.47	88.74	43.89	
	MEAN / ug m-3	43.74	43.28	43.96	87.64	43.47	
	K (% / V)	0.027	0.020	0.018	0.014	0.024	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 67: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
220 V	15/07/2010 13:20	0.55	0.49	0.75	0.63	0.58	0.70		
	15/07/2010 13:50	0.54	0.52	0.76	0.62	0.61	0.71		
	15/07/2010 14:20	0.56	0.51	0.74	0.64	0.58	0.70		
	15/07/2010 14:50	0.54	0.51	0.74	0.64	0.57	0.71		
	15/07/2010 15:20	0.54	0.49	0.75	0.63	0.61	0.78		
	15/07/2010 15:50	0.57	0.51	0.72	0.64	0.60	0.73		
	MEAN / ug m-3	0.55	0.50	0.74	0.64	0.59	0.73		
240 V	15/07/2010 09:50	0.57	0.51	0.74	0.66	0.66	0.68		
	15/07/2010 10:20	0.57	0.55	0.76	0.67	0.62	0.74		
	15/07/2010 10:50	0.55	0.51	0.81	0.66	0.59	0.72		
	15/07/2010 11:20	0.55	0.49	0.76	0.65	0.61	0.73		
	15/07/2010 11:50	0.55	0.48	0.72	0.66	0.64	0.75		
	15/07/2010 12:20	0.56	0.48	0.75	0.61	0.65	0.73		
	MEAN / ug m-3	0.55	0.49	0.76	0.65	0.62	0.73		
	K (% / V)	0.00067	0.043	0.043	0.023	0.086	0.0018		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 67 (continued): Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.									
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
220 V	15/07/2010 13:20	0.65	1.46	0.66	0.87	0.97	0.78		
	15/07/2010 13:50	0.66	1.35	0.69	0.86	0.82	0.65		
	15/07/2010 14:20	0.68	1.43	0.77	0.84	0.82	0.74		
	15/07/2010 14:50	0.66	1.36	0.60	0.78	0.86	0.67		
	15/07/2010 15:20	0.70	1.34	0.70	0.78	0.69	0.78		
	15/07/2010 15:50	0.70	1.34	0.67	0.77	0.73	0.77		
	MEAN / ug m-3	0.69	1.37	0.69	0.79	0.78	0.74		
240 V	15/07/2010 09:50	0.65	1.29	0.63	0.65	0.75	0.50		
	15/07/2010 10:20	0.66	1.38	0.67	0.73	0.70	0.66		
	15/07/2010 10:50	0.65	1.34	0.76	0.74	0.77	0.64		
	15/07/2010 11:20	0.62	1.33	0.72	0.79	0.87	0.77		
	15/07/2010 11:50	0.69	1.44	0.74	0.76	0.81	0.71		
	15/07/2010 12:20	0.64	1.46	0.68	0.81	0.76	0.71		
	MEAN / ug m-3	0.65	1.39	0.73	0.78	0.80	0.70		
	K (% / V)	0.081	0.026	0.085	0.032	0.045	0.069		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 68: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
220 V	15/07/2010 13:20	0.56	0.50	0.75	0.63	0.57	0.75		
	15/07/2010 13:50	0.55	0.52	0.74	0.64	0.57	0.73		
	15/07/2010 14:20	0.55	0.52	0.73	0.64	0.61	0.74		
	15/07/2010 14:50	0.55	0.50	0.74	0.64	0.59	0.73		
	15/07/2010 15:20	0.56	0.50	0.73	0.63	0.55	0.71		
	15/07/2010 15:50	0.55	0.50	0.76	0.63	0.59	0.75		
	MEAN / ug m-3	0.55	0.50	0.74	0.64	0.59	0.73		
240 V	15/07/2010 09:50	0.56	0.47	0.76	0.63	0.57	0.71		
	15/07/2010 10:20	0.56	0.54	0.76	0.67	0.61	0.71		
	15/07/2010 10:50	0.57	0.57	0.77	0.66	0.61	0.76		
	15/07/2010 11:20	0.55	0.51	0.75	0.64	0.58	0.72		
	15/07/2010 11:50	0.56	0.52	0.75	0.62	0.58	0.74		
	15/07/2010 12:20	0.57	0.53	0.74	0.66	0.61	0.74		
	MEAN / ug m-3	0.56	0.53	0.75	0.65	0.59	0.74		
	K (% / V)	0.022	0.078	0.033	0.022	0.016	0.018		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 68 (continued): Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.									
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
220 V	15/07/2010 13:20	0.66	1.44	0.67	0.86	0.86	1.03		
	15/07/2010 13:50	0.66	1.39	0.70	0.81	0.76	0.92		
	15/07/2010 14:20	0.67	1.35	0.71	0.79	0.80	0.78		
	15/07/2010 14:50	0.68	1.36	0.66	0.79	0.75	0.70		
	15/07/2010 15:20	0.70	1.41	0.68	0.78	0.79	0.75		
	15/07/2010 15:50	0.70	1.35	0.69	0.81	0.77	0.73		
	MEAN / ug m-3	0.69	1.37	0.69	0.79	0.78	0.74		
240 V	15/07/2010 09:50	0.65	1.30	0.69	0.73	0.64	1.11		
	15/07/2010 10:20	0.66	1.36	0.72	0.79	0.74	1.18		
	15/07/2010 10:50	0.69	1.42	0.65	0.77	0.77	1.06		
	15/07/2010 11:20	0.69	1.40	0.71	0.80	0.85	0.99		
	15/07/2010 11:50	0.71	1.37	0.64	0.80	0.74	0.85		
	15/07/2010 12:20	0.68	1.37	0.71	0.80	0.79	0.92		
	MEAN / ug m-3	0.69	1.39	0.68	0.79	0.79	0.95		
	K (% / V)	0.0080	0.024	0.017	0.0014	0.018	0.42		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 69: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.							
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
220 V	15/07/2010 09:50	0.78	0.48	0.50	0.98	0.89	
	15/07/2010 10:20	0.47	0.49	0.48	0.97	0.58	
	15/07/2010 10:50	0.59	0.50	0.52	1.04	0.56	
	15/07/2010 11:20	0.52	0.48	0.50	0.98	0.53	
	15/07/2010 11:50	0.53	0.50	0.52	1.03	0.56	
	15/07/2010 12:20	0.47	0.45	0.49	0.97	0.49	
	MEAN / ug m-3	0.53	0.48	0.51	1.00	0.53	
240 V	15/07/2010 13:20	0.52	0.48	0.50	1.01	0.52	
	15/07/2010 13:50	0.48	0.51	0.52	1.04	0.54	
	15/07/2010 14:20	0.51	0.49	0.49	0.98	0.49	
	15/07/2010 14:50	0.51	0.53	0.51	1.03	0.51	
	15/07/2010 15:20	0.48	0.50	0.50	0.99	0.49	
	15/07/2010 15:50	0.52	0.48	0.52	1.03	0.52	
	MEAN / ug m-3	0.50	0.50	0.51	1.01	0.50	
	K (% / V)	0.060	0.048	0.011	0.0032	0.082	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 70: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V.							
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
220 V	15/07/2010 09:50	0.79	0.50	0.49	0.98	1.36	
	15/07/2010 10:20	0.54	0.49	0.50	0.97	0.62	
	15/07/2010 10:50	0.51	0.50	0.52	1.02	0.56	
	15/07/2010 11:20	0.52	0.50	0.50	0.99	0.54	
	15/07/2010 11:50	0.53	0.53	0.52	1.03	0.51	
	15/07/2010 12:20	0.54	0.51	0.50	1.00	0.51	
	MEAN / ug m-3	0.53	0.51	0.51	1.01	0.53	
240 V	15/07/2010 13:20	0.52	0.48	0.51	1.03	0.50	
	15/07/2010 13:50	0.51	0.49	0.51	1.03	0.52	
	15/07/2010 14:20	0.51	0.50	0.51	0.97	0.49	
	15/07/2010 14:50	0.50	0.52	0.51	1.02	0.51	
	15/07/2010 15:20	0.52	0.49	0.50	1.00	0.51	
	15/07/2010 15:50	0.49	0.48	0.50	1.03	0.51	
	MEAN / ug m-3	0.50	0.50	0.51	1.01	0.50	
	K (% / V)	0.060	0.033	0.0081	0.0040	0.070	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.6.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: 2,2,4-trimethyl pentane;
n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene;
1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane;
n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene;
1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.7 Dependence on surrounding air temperature (B7)

5.7.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Sensitivity coefficient for the influence of the surrounding air temperature at the span concentration value (between 70 % and 90 % of the certification range) of benzene,

$$b_{T_s} < 0.2 \% K^{-1}$$

5.7.2 Additional requirements

Determine sensitivity coefficient for the influence of the surrounding air temperature at 1/10 of the annual mean concentration limit value for benzene.

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.7.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs temperature controlled environmental chamber capable of maintaining a constant temperature and operating in the range +18 °C to +24 °C, temperature sensor.

5.7.4 Testing

This test was carried out at 1/10 of the limit value of benzene, namely $0.5 \mu\text{g m}^{-3}$ (0.15 ppb) and at the span value (between 70% and 90% of certification range), namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test employed known concentrations of nominally 0.15 ppb and 13.9 ppb at each temperature.

The CAMs were contained in an environmental chamber, but the gas injection system was outside the chamber. The influence of the surrounding air temperature was determined at the minimum and maximum temperature specified by the manufacturer as the operating range for the analyser, **18°C** and **24°C**. A total of 5 determinand sample injections were carried out at each concentration at 18°C, and then again at 24°C. The first sample result was rejected in each case.

The CAMS were given an overnight warm up time for equilibration. The CAMs sampled ambient air before and after the test, and also during the temperature change from **18°C to 24°C**.

5.7.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.7.6 Results

At each temperature setting 4 individual measurements for each concentration were employed.

The uncertainty caused by changes in surrounding temperature u_{T_s} was then determined

$$u_{T_s} = \frac{b_{T_s} \cdot |\Delta T_s|}{2\sqrt{3}}$$

where the sensitivity coefficient b_{T_s} ($(\mu\text{g m}^{-3})/\text{K}$) is given by

$$b_{T_s} = \frac{|c_{T_s, \max} - c_{T_s, \min}|}{|\Delta T_s|}$$

and

$c_{T_s, \max}$ is the average of the individual measurement at maximum surrounding temperature $T_{s, \max}$

$c_{T_s, \min}$ is the average of the individual measurement at minimum surrounding temperature $T_{s, \min}$

$$\Delta T_s = T_{s, \max} - T_{s, \min}$$

In the present standard when the performance criterion is expressed as a percentage then the test value shall be calculated from $100u/C$, where u is the uncertainty component in $\mu\text{g m}^{-3}$, and C is the highest concentration used in the test.

The standard is being reviewed, and in certain tests, the performance criteria, K , are ambiguous. Certain “accredited” laboratories have made the interpretation as:

$$K = \frac{u_T \cdot 100}{C \cdot \Delta T_s}$$

where C is the highest concentration used in the test.

An alternative interpretation is also included based on the sensitivity coefficient.

The sensitivity coefficient expressed as a percentage is given by:

$$b_{T_s} = \frac{|c_{T_s, \max} - c_{T_s, \min}|}{c_{T_s, \max}} \cdot \frac{100\%}{\Delta T_s}$$

Tables 71, 72, 73 and 74 summarise the results obtained for the ambient temperature test for all four CAMs at the span concentration.

Tables 75, 76, 77 and 78 summarise the results obtained for the ambient temperature test for all four CAMs at $1/10^{\text{th}}$ the limit concentration.

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Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 71: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
18°C	13/05/2011 13:39	49.27	44.62	65.48	55.89	50.64	63.04		
	13/05/2011 14:09	49.62	44.94	65.92	56.32	51.56	64.83		
	13/05/2011 14:39	49.82	45.12	65.94	56.76	52.44	65.04		
	13/05/2011 15:09	49.68	44.87	65.79	56.48	52.10	65.04		
	13/05/2011 15:39	49.33	44.97	65.69	56.12	52.25	64.86		
	13/05/2011 16:09	49.17	44.80	65.58	56.45	52.22	64.95		
	MEAN / ug m-3	49.50	44.94	65.75	56.45	52.25	64.97		
24°C	16/05/2011 14:09	50.13	44.74	Not Recognised	Not Recognised	Not Recognised	64.54		
	16/05/2011 14:39	50.47	45.47	Not Recognised	Not Recognised	Not Recognised	65.97		
	16/05/2011 15:09	50.34	45.49	Not Recognised	Not Recognised	Not Recognised	66.34		
	16/05/2011 15:39	50.24	45.27	Not Recognised	Not Recognised	Not Recognised	66.30		
	16/05/2011 16:09	50.29	45.04	Not Recognised	Not Recognised	Not Recognised	65.75		
	16/05/2011 16:39	50.20	45.28	67.04	57.69	Not Recognised	65.59		
	MEAN / ug m-3	50.27	45.27	67.04	57.69	Not Recognised	65.99		
	K (% / K)	0.08	0.04	0.10	0.12	No Result	0.08		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 71 (continued): Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.							
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
18°C	13/05/2011 13:39	56.72	109.16	50.49	54.70	Not Recognised	Not Recognised
	13/05/2011 14:09	59.69	116.19	54.07	61.41	Not Recognised	Not Recognised
	13/05/2011 14:39	60.42	117.80	54.94	63.50	Not Recognised	Not Recognised
	13/05/2011 15:09	60.93	121.47	60.22	64.21	64.19	Not Recognised
	13/05/2011 15:39	60.95	121.60	60.19	64.62	Not Recognised	Not Recognised
	13/05/2011 16:09	61.06	121.82	60.26	65.00	65.20	63.53
	MEAN / ug m-3	60.84	120.67	58.90	64.33	64.69	63.53
24°C	16/05/2011 14:09	58.98	111.75	52.37	57.39	55.66	53.13
	16/05/2011 14:39	61.56	117.65	55.32	63.18	62.92	60.40
	16/05/2011 15:09	62.11	119.01	56.11	64.70	64.77	62.86
	16/05/2011 15:39	62.21	119.34	56.27	65.38	65.61	63.89
	16/05/2011 16:09	62.33	119.50	56.31	65.61	66.06	64.49
	16/05/2011 16:39	62.15	119.37	56.21	65.60	66.27	64.43
	MEAN / ug m-3	62.20	119.30	56.23	65.32	65.68	63.92
	K (% / K)	0.12	0.06	0.24	0.08	0.08	0.03

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 72: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
18°C	13/05/2011 13:39	49.20	44.66	65.51	56.27	51.16	63.24		
	13/05/2011 14:09	49.56	45.00	65.86	56.64	52.21	64.76		
	13/05/2011 14:39	49.19	45.04	65.90	56.75	52.31	64.93		
	13/05/2011 15:09	49.15	44.97	65.81	56.63	52.40	65.14		
	13/05/2011 15:39	48.91	44.92	65.65	56.54	52.26	64.83		
	13/05/2011 16:09	49.17	44.80	65.58	56.45	52.22	64.95		
	MEAN / ug m-3	49.11	44.93	65.74	56.59	52.30	64.96		
24°C	16/05/2011 14:09	48.76	44.93	65.22	55.95	51.12	63.16		
	16/05/2011 14:39	48.81	45.32	65.61	56.36	52.22	64.69		
	16/05/2011 15:09	49.02	45.37	65.69	56.47	52.38	64.53		
	16/05/2011 15:39	48.89	45.33	65.58	56.42	52.33	64.83		
	16/05/2011 16:09	48.73	45.25	65.50	56.28	52.28	64.85		
	16/05/2011 16:39	48.53	45.13	65.36	56.18	52.17	64.72		
	MEAN / ug m-3	48.79	45.27	65.53	56.33	52.29	64.73		
	K (% / K)	0.03	0.04	0.02	0.02	0.00	0.02		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 72 (continued): Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.										
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
18°C	13/05/2011 13:39	57.95	114.02	55.89	55.75	53.19	50.30			
	13/05/2011 14:09	60.53	120.20	59.26	62.31	61.44	59.07			
	13/05/2011 14:39	61.06	121.42	60.02	63.97	63.66	61.65			
	13/05/2011 15:09	61.16	121.85	60.29	64.58	64.54	62.72			
	13/05/2011 15:39	61.13	121.86	60.30	64.90	65.00	63.30			
	13/05/2011 16:09	61.06	121.82	60.26	65.00	65.20	63.53			
	MEAN / ug m-3	61.10	121.74	60.21	64.61	64.60	62.80			
24°C	16/05/2011 14:09	59.03	111.08	52.11	57.06	55.33	52.78			
	16/05/2011 14:39	61.30	116.21	54.75	62.63	62.13	60.25			
	16/05/2011 15:09	61.77	117.30	55.34	64.00	63.96	62.39			
	16/05/2011 15:39	61.85	117.54	55.47	64.53	64.73	63.25			
	16/05/2011 16:09	61.87	117.69	55.54	64.77	65.08	63.89			Not Recognised
	16/05/2011 16:39	61.73	117.53	55.47	64.83	65.24	63.89			
	MEAN / ug m-3	61.81	117.51	55.45	64.53	64.75	63.18			
	K (% / K)	0.06	0.18	0.42	0.01	0.01	0.03			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 73: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
18°C	13/05/2011 13:39	43.58	49.85	58.33	115.68	57.64
	13/05/2011 14:09	45.12	52.12	61.33	122.26	61.18
	13/05/2011 14:39	43.52	50.48	59.53	118.78	59.44
	13/05/2011 15:09	44.71	52.01	61.25	122.50	61.40
	13/05/2011 15:39	43.61	50.76	60.09	120.02	59.94
	13/05/2011 16:09	44.80	52.22	61.06	121.82	60.26
	MEAN / ug m-3	44.16	51.37	60.48	120.78	60.26
24°C	16/05/2011 14:09	44.22	59.86	80.93	159.00	78.90
	16/05/2011 14:39	41.20	56.30	76.93	151.55	75.15
	16/05/2011 15:09	44.01	60.30	82.39	162.46	80.94
	16/05/2011 15:39	41.77	57.33	78.82	155.26	76.40
	16/05/2011 16:09	44.35	60.86	83.19	164.17	81.67
	16/05/2011 16:39	41.24	56.69	77.77	153.44	75.87
	MEAN / ug m-3	42.84	58.79	80.54	158.83	78.72
	K (% / K)	0.16	0.76	1.75	1.66	1.63

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 74: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
18°C	13/05/2011 13:39	43.79	49.90	57.52	114.50	56.03
	13/05/2011 14:09	44.95	51.91	60.96	121.90	59.95
	13/05/2011 14:39	44.05	51.20	60.23	120.55	59.25
	13/05/2011 15:09	44.72	52.01	61.38	122.94	60.56
	13/05/2011 15:39	44.26	51.43	60.80	121.79	61.00
	13/05/2011 16:09	44.80	52.22	61.06	121.82	60.26
	MEAN / ug m-3	44.46	51.72	60.87	121.78	60.27
24°C	16/05/2011 14:09	44.20	59.37	79.09	157.20	76.62
	16/05/2011 14:39	42.97	58.26	78.71	157.13	76.77
	16/05/2011 15:09	44.53	60.74	82.24	164.44	80.52
	16/05/2011 15:39	43.34	58.92	80.39	160.52	78.65
	16/05/2011 16:09	44.16	60.86	82.92	166.04	81.45
	16/05/2011 16:39	42.49	58.77	79.93	159.86	78.12
	MEAN / ug m-3	43.63	59.82	81.37	162.71	79.69
	K (% / K)	0.10	0.83	1.79	1.79	1.72

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 75: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
18°C	16/05/2011 10:39	0.56	0.77	0.70	0.61	0.60	0.68		
	16/05/2011 11:09	0.57	0.50	0.71	0.63	0.60	0.74		
	16/05/2011 11:39	0.59	0.59	0.66	0.62	0.60	0.73		
	16/05/2011 12:09	0.57	0.51	0.73	0.60	0.60	0.72		
	16/05/2011 12:39	0.56	0.46	0.73	0.59	0.58	0.72		
	16/05/2011 13:09	0.55	0.50	0.73	0.63	0.58	0.72		
	MEAN / ug m-3	0.57	0.51	0.71	0.61	0.59	0.72		
24°C	16/05/2011 14:09	0.63	0.33	0.72	0.70	Not Recognised	0.74		
	16/05/2011 14:39	0.61	0.33	0.00	0.00	Not Recognised	0.75		
	16/05/2011 15:09	0.58	0.30	0.71	0.69	Not Recognised	0.74		
	16/05/2011 15:39	0.61	0.36	0.73	0.70	Not Recognised	0.73		
	16/05/2011 16:09	0.60	0.31	0.00	0.00	Not Recognised	0.78		
	16/05/2011 16:39	0.59	0.34	0.00	0.00	Not Recognised	0.74		
	MEAN / ug m-3	0.59	0.33	0.36	0.35	Not Recognised	0.75		
	K (% / K)	0.25	1.87	2.40	2.08	Not Recognised	0.17		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 75 (continued): Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.										
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
18°C	16/05/2011 10:39	0.67	1.28	0.67	0.68	Not Recognised	Not Recognised			
	16/05/2011 11:09	0.72	1.36	0.75	0.78	Not Recognised	Not Recognised			
	16/05/2011 11:39	0.74	1.37	0.68	0.83	Not Recognised	Not Recognised			
	16/05/2011 12:09	0.73	1.36	0.72	0.76	Not Recognised	Not Recognised			
	16/05/2011 12:39	0.73	1.39	0.65	0.83	Not Recognised	Not Recognised			
	16/05/2011 13:09	0.68	1.35	0.68	0.78	Not Recognised	Not Recognised			
	MEAN / ug m-3	0.72	1.37	0.68	0.80	Not Recognised	Not Recognised			
24°C	16/05/2011 14:09	0.73	1.36	0.73	0.73	Not Recognised	Not Recognised			
	16/05/2011 14:39	0.70	1.43	0.75	0.82	Not Recognised	Not Recognised			
	16/05/2011 15:09	0.76	1.42	0.76	0.86	Not Recognised	Not Recognised			
	16/05/2011 15:39	0.77	1.45	0.72	0.79	Not Recognised	Not Recognised			
	16/05/2011 16:09	0.75	1.44	0.87	0.81	Not Recognised	Not Recognised			
	16/05/2011 16:39	0.71	1.43	0.77	0.83	Not Recognised	Not Recognised			
	MEAN / ug m-3	0.75	1.43	0.78	0.82	Not Recognised	Not Recognised			
	K (% / K)	0.19	0.25	0.72	0.16	Not Recognised	Not Recognised			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 76: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
18°C	16/05/2011 10:39	0.56	0.48	0.71	0.64	0.59	0.72		
	16/05/2011 11:09	0.56	0.50	0.72	0.65	0.59	0.72		
	16/05/2011 11:39	0.57	0.49	0.70	0.63	0.60	0.73		
	16/05/2011 12:09	0.54	0.48	0.72	0.64	0.59	0.73		
	16/05/2011 12:39	0.56	0.49	0.71	0.63	0.60	0.73		
	16/05/2011 13:09	0.55	0.50	0.73	0.63	0.58	0.72		
	MEAN / ug m-3	0.55	0.49	0.71	0.63	0.59	0.73		
24°C	16/05/2011 14:09	0.57	0.50	0.87	0.66	0.61	0.74		
	16/05/2011 14:39	0.58	0.53	0.89	0.65	0.62	0.77		
	16/05/2011 15:09	0.58	0.48	0.85	0.69	0.61	0.78		
	16/05/2011 15:39	0.57	0.50	0.85	0.66	0.63	0.77		
	16/05/2011 16:09	0.59	0.49	0.86	0.66	0.62	0.75		
	16/05/2011 16:39	0.58	0.50	0.87	0.66	0.62	0.77		
	MEAN / ug m-3	0.58	0.49	0.86	0.67	0.62	0.77		
	K (% / K)	0.24	0.01	0.97	0.28	0.23	0.26		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 76 (continued): Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.										
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
18°C	16/05/2011 10:39	0.66	1.37	0.68	0.75	0.77	0.78			
	16/05/2011 11:09	0.67	1.34	0.70	0.79	0.68	0.78			
	16/05/2011 11:39	0.65	1.40	0.64	0.81	0.76	0.77			
	16/05/2011 12:09	0.70	1.40	0.69	0.82	0.78	0.77			
	16/05/2011 12:39	0.70	1.38	0.64	0.80	0.72	0.74			
	16/05/2011 13:09	0.68	1.35	0.68	0.78	0.77	0.73			
	MEAN / ug m-3	0.68	1.38	0.66	0.80	0.76	0.75			
24°C	16/05/2011 14:09	0.68	1.37	0.64	0.76	0.68	1.53			
	16/05/2011 14:39	0.71	1.42	0.67	0.81	0.74	1.28			
	16/05/2011 15:09	0.71	1.43	0.67	0.80	0.73	1.15			
	16/05/2011 15:39	0.69	1.42	0.69	0.81	0.78	1.07			
	16/05/2011 16:09	0.71	1.43	0.68	0.81	0.77	0.99			
	16/05/2011 16:39	0.72	1.42	0.68	0.82	0.77	0.97			
	MEAN / ug m-3	0.71	1.43	0.68	0.81	0.76	1.05			
	K (% / K)	0.18	0.16	0.12	0.04	0.04	1.99			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 77: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
18°C	13/05/2011 10:09	0.66	0.62	0.69	1.40	1.26
	13/05/2011 10:39	0.54	0.57	0.68	1.36	0.78
	13/05/2011 11:09	0.51	0.61	0.70	1.41	0.74
	13/05/2011 11:39	0.50	0.58	0.69	1.38	0.70
	13/05/2011 12:09	0.51	0.57	0.70	1.41	0.72
	13/05/2011 12:39	0.50	0.58	0.68	1.35	0.68
	MEAN / ug m-3	0.51	0.59	0.69	1.39	0.71
24°C	16/05/2011 10:39	0.50	0.47	0.46	0.96	0.54
	16/05/2011 11:09	0.54	0.52	0.53	1.07	0.57
	16/05/2011 11:39	0.49	0.49	0.50	1.02	0.53
	16/05/2011 12:09	0.53	0.52	0.54	1.06	0.54
	16/05/2011 12:39	0.49	0.49	0.50	0.99	0.50
	16/05/2011 13:09	0.52	0.50	0.54	1.06	0.53
	MEAN / ug m-3	0.51	0.50	0.52	1.03	0.53
	K (% / K)	0.002	0.72	1.29	1.30	1.34

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 78: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.							
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	
18°C	13/05/2011 10:09	0.77	0.59	0.66	1.33	1.73	
	13/05/2011 10:39	0.54	0.59	0.68	1.35	0.83	
	13/05/2011 11:09	0.50	0.59	0.69	1.38	0.73	
	13/05/2011 11:39	0.51	0.59	0.68	1.36	0.70	
	13/05/2011 12:09	0.49	0.58	0.68	1.38	0.69	
	13/05/2011 12:39	0.50	0.58	0.68	1.35	0.68	
	MEAN / ug m-3	0.50	0.58	0.68	1.37	0.70	
24°C	16/05/2011 10:39	0.57	0.61	0.68	1.30	0.82	
	16/05/2011 11:09	0.55	0.62	0.72	1.40	0.76	
	16/05/2011 11:39	0.55	0.62	0.71	1.36	0.72	
	16/05/2011 12:09	0.54	0.61	0.72	1.40	0.73	
	16/05/2011 12:39	0.55	0.61	0.70	1.35	0.71	
	16/05/2011 13:09	0.54	0.61	0.71	1.40	0.72	
	MEAN / ug m-3	0.54	0.62	0.71	1.38	0.72	
	K (% / K)	0.43	0.28	0.21	0.04	0.17	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.7.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; n-octane; ethyl-benzene; m-xylene; p-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Additional performance criterion **not met** for the determinands: o-xylene

No value for Toluene.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Additional performance criterion **not met** for the determinands: o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **not met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **not met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.8 Cross interference with ozone (B8)

5.8.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Influence of the interference from ozone at the span concentration value (between 70 % and 90 % of the certification range) of benzene,

$$b_{O_3} < 5 \%$$

5.8.2 Additional requirements

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.8.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs, ozone generator and ozone photometer.

5.8.4 Testing

This test was carried out at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other hydrocarbon determinands involved in the test employed a known concentration of nominally 13.9 ppb.

A total of 5 determinand sample injections were carried out without the presence of ozone. This will be followed by 5 sample injections with the determinand and the cross interferent ozone present simultaneously. The first sample result from each group of five was rejected in each case.

The supplied concentration of ozone was a known value of nominally $180 \mu\text{g m}^{-3}$ (90 ppb). A correction to the concentration of the determinand was made for the dilution effect due to the addition of the interferent. The CAMs sampled ambient air before and after the test.

5.8.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

5.8.6 Results

The influence quantity of ozone, b_{O_3} , is calculated as follows:

$$b_{O_3} = \frac{|c_{O_3} - c|}{c_{\text{int}, O_3}}$$

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

where

$$u_{O_3} = b_{O_3} \sqrt{\frac{c_{\text{int},O_3}^2}{12}} = \frac{|c_{O_3} - c|}{2\sqrt{3}}$$

where c_{O_3} is the average of the individual measurements at the maximum ozone concentration
 c_{int,O_3}

and c is the average of the individual measurement without ozone.

Tables 79, 80, 81 and 82 summarise the results for the ozone cross sensitivity test for all four CAMs at the span concentration.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 79: Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).										
	ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
Without Interferent	26/07/2011 13:34	40.48	36.93	54.16	46.19	43.31	54.35			
	26/07/2011 14:04	40.50	36.94	54.15	45.92	43.29	54.07			
	26/07/2011 14:34	40.42	36.72	54.08	45.88	43.46	54.10			
	26/07/2011 15:04	40.28	36.62	53.98	46.07	43.03	53.88			
	26/07/2011 15:34	40.24	36.70	53.80	45.83	42.89	53.28			
	26/07/2011 16:04	40.31	36.73	53.77	46.28	42.81	53.25			
	MEAN / ug m ⁻³	40.31	36.69	53.91	46.01	43.05	53.63			
With Interferent	26/07/2011 17:04	42.02	38.17	56.19	47.58	44.02	54.74			
	26/07/2011 17:34	42.14	38.45	56.41	47.81	44.69	55.71			
	26/07/2011 18:04	42.33	38.49	56.24	48.02	44.80	55.57			
	26/07/2011 18:34	42.17	38.31	56.12	47.87	44.56	55.66			
	26/07/2011 19:04	42.00	38.22	55.94	47.75	44.52	55.33			
	26/07/2011 19:34	41.79	38.08	55.82	47.70	44.41	55.46			
	MEAN / ug m ⁻³	42.08	38.28	56.03	47.84	44.57	55.51			
	k / %	1.26	1.25	1.14	1.14	1.03	1.02			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 79 (continued): Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).										
	ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
Without Interferrent	26/07/2011 13:34	50.52	101.11	49.89	53.89	54.07	52.45			
	26/07/2011 14:04	50.27	100.34	49.56	53.25	53.63	52.04			
	26/07/2011 14:34	50.19	100.04	49.45	53.40	53.61	52.12			
	26/07/2011 15:04	50.10	99.90	49.33	53.22	53.47	52.06			
	26/07/2011 15:34	50.00	99.64	49.20	53.09	53.26	51.90			
	26/07/2011 16:04	50.06	99.87	49.40	53.28	53.45	52.08			
	MEAN / ug m ⁻³	50.09	99.86	49.35	53.25	53.45	52.04			
With Interferrent	26/07/2011 17:04	50.45	99.88	49.44	51.49	51.21	49.29			
	26/07/2011 17:34	52.15	103.60	51.26	54.36	54.60	52.89			
	26/07/2011 18:04	52.15	104.02	51.44	54.67	54.94	53.15			
	26/07/2011 18:34	52.01	103.68	51.31	54.54	54.88	53.17			
	26/07/2011 19:04	51.93	103.67	51.27	54.36	54.70	53.01			
	26/07/2011 19:34	51.86	103.54	51.16	54.54	54.78	52.87			
	MEAN / ug m ⁻³	51.99	103.73	51.30	54.53	54.83	53.05			
	k / %	1.10	1.12	1.14	0.69	0.74	0.56			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 80: Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m ⁻³	N-HEPTANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
Without Interferrent	26/07/2011 13:34	40.88	37.09	54.22	46.69	43.35	53.82		
	26/07/2011 14:04	40.73	36.98	54.18	46.70	43.07	53.80		
	26/07/2011 14:34	40.68	36.97	54.07	46.53	43.05	53.54		
	26/07/2011 15:04	40.55	36.87	53.99	46.47	42.99	53.61		
	26/07/2011 15:34	40.45	36.80	53.87	46.29	42.86	53.48		
	26/07/2011 16:04	40.31	36.73	53.77	46.28	42.81	53.25		
	MEAN / ug m ⁻³	40.50	36.84	53.92	46.39	42.93	53.47		
With Interferrent	26/07/2011 17:04	42.30	38.37	56.18	48.24	44.15	54.65		
	26/07/2011 17:34	42.43	38.63	56.39	48.56	44.87	55.73		
	26/07/2011 18:04	42.24	38.51	56.13	48.20	44.80	55.69		
	26/07/2011 18:34	42.39	38.43	56.09	48.45	44.73	55.57		
	26/07/2011 19:04	42.11	38.24	55.96	48.28	44.51	55.14		
	26/07/2011 19:34	41.92	38.20	55.75	48.04	44.48	55.07		
	MEAN / ug m ⁻³	42.16	38.34	55.98	48.24	44.63	55.37		
	k / %	1.19	1.18	1.10	1.15	1.14	1.03		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 80 (continued): Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).										
	ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
Without Interferrent	26/07/2011 13:34	50.68	101.35	50.05	53.99	54.02	52.92			
	26/07/2011 14:04	50.12	100.41	49.52	53.25	53.25	51.73			
	26/07/2011 14:34	50.23	100.33	49.61	53.40	53.28	0.00			
	26/07/2011 15:04	50.14	100.24	49.51	53.35	53.45	52.01			
	26/07/2011 15:34	49.85	99.88	49.28	53.01	53.02	51.51			
	26/07/2011 16:04	50.06	99.87	49.40	53.28	53.45	52.08			
	MEAN / ug m ⁻³	50.07	100.08	49.45	53.26	53.30	38.90			
With Interferrent	26/07/2011 17:04	50.65	100.40	49.57	51.10	50.24	48.63			
	26/07/2011 17:34	51.93	103.37	51.19	53.63	53.06	51.46			
	26/07/2011 18:04	51.88	103.52	51.25	53.75	53.23	51.61			
	26/07/2011 18:34	52.10	105.96	55.16	53.68	53.13	51.48			
	26/07/2011 19:04	51.71	105.58	54.91	53.25	52.57	0.00			
	26/07/2011 19:34	51.53	102.97	50.99	53.42	52.91	51.33			
	MEAN / ug m ⁻³	51.80	104.51	53.08	53.52	52.96	38.60			
k / %		1.00	1.28	2.12	0.14	0.18	0.22			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 81: Cross sensitivity with ozone test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Cross sensitivity with ozone test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE			
Without Interferrent	26/07/2011 13:34	37.37	37.32	36.70	73.87	36.89			
	26/07/2011 14:04	36.78	36.49	36.34	73.63	36.03			
	26/07/2011 14:34	37.90	37.33	36.76	74.26	37.27			
	26/07/2011 15:04	36.88	36.59	35.57	72.95	36.43			
	26/07/2011 15:34	37.73	37.30	36.37	74.98	37.56			
	26/07/2011 16:04	36.73	36.29	36.83	73.48	36.34			
	MEAN / ug m-3	37.31	36.88	36.38	73.92	36.90			
With Interferrent	26/07/2011 17:04	38.03	37.24	38.41	73.93	35.09			
	26/07/2011 17:34	39.22	38.63	37.70	75.96	37.57			
	26/07/2011 18:04	38.22	37.38	38.39	75.89	36.11			
	26/07/2011 18:34	38.91	38.19	39.44	76.95	36.94			
	26/07/2011 19:04	38.05	37.40	39.72	75.42	35.26			
	26/07/2011 19:34	38.56	38.33	37.94	75.16	36.67			
	MEAN / ug m-3	38.43	37.83	38.87	75.85	36.24			
k / %		0.87	0.74	1.98	0.76	0.51			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 82: Cross sensitivity with ozone test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Cross sensitivity with ozone test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Without Interferrent	26/07/2011 13:34	37.33	36.95	37.45	74.75	36.98
	26/07/2011 14:04	36.97	36.47	36.93	73.64	36.42
	26/07/2011 14:34	37.45	37.33	37.46	74.79	37.03
	26/07/2011 15:04	37.05	36.71	36.91	73.68	36.44
	26/07/2011 15:34	37.33	36.92	37.36	74.63	36.91
	26/07/2011 16:04	36.73	36.29	36.83	73.48	36.34
	MEAN / ug m-3	37.14	36.81	37.14	74.15	36.68
With Interferrent	26/07/2011 17:04	38.14	37.39	37.27	74.05	36.64
	26/07/2011 17:34	38.80	38.20	38.26	76.26	38.14
	26/07/2011 18:04	38.30	37.67	37.74	75.25	37.42
	26/07/2011 18:34	38.71	38.15	38.18	76.14	37.83
	26/07/2011 19:04	38.23	37.56	37.57	75.01	37.23
	26/07/2011 19:34	38.43	37.85	37.84	75.59	37.77
	MEAN / ug m-3	38.42	37.81	37.83	75.50	37.56
	k / %	1.00	0.78	0.54	0.53	0.69

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.8.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.9 Cross interference with water (relative humidity test) (B9)

5.9.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Influence of the interference from relative humidity at the span concentration value (between 70 % and 90 % of the certification range) of benzene,

$$b_{rh} < 4 \%$$

5.9.2 Additional requirements

Determine influence of the interference from relative humidity at 1/10 of the annual mean concentration limit value for benzene.

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.9.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas chamber and manifold to distribute the determinand mixtures to the CAMs, a water vapour generator, mass balance.

5.9.4 Testing

This test was carried out at 1/10 of the limit value of benzene, namely $0.5 \mu\text{g m}^{-3}$ (0.15 ppb), and at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other hydrocarbon determinands involved in the test employed a known concentration of nominally 0.15 ppb and 13.9 ppb.

A total of 5 valid determinand sample injections were carried out at **the lower** determinand concentration in the presence of water vapour at a relative humidity of 20%. The first sample result from each group of five was rejected in each case.

This was followed by 5 valid determinand sample injections at **the lower** determinand concentration in the presence of water vapour at a relative humidity of 80%. The first sample result from each group of five was rejected in each case.

The test was repeated in a similar manner at the **higher** concentration (span value).

A correction to the concentration of the determinand was made for any dilution effect due to the addition of the interferent.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
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 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

A Controlled Atmosphere Test Facility (CATFAC) developed at NPL was employed to generate the appropriate specified atmospheres. Scrubbed air was employed as the diluent. The flow rate measurements were carried out before each test. The CAMs sampled scrubbed air from the CATFAC before and after the test.

5.9.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

5.9.6 Results

The influence of humidity, b_{rh} , (($\mu\text{g m}^{-3}$)/%RH) is defined in the standard as:

$$b_{rh} = \frac{|c_{rh,max} - c_{rh,min}|}{(c_{rh,max} + c_{rh,min})/2} \cdot 100\%$$

where

$c_{rh,max}$ is the average of the individual measurements at the maximum relative humidity.

$c_{rh,min}$ is the average of the individual measurements at the minimum relative humidity.

This definition makes no sense since the equation does not deliver the required units (($\mu\text{g m}^{-3}$)/%RH) for the influence of humidity. The approach taken here was therefore to adopt a method that is compatible with the new draft standard in its philosophy by modifying the denominator to incorporate relative humidity (in units of %RH) such that:

$$b_{rh} = \frac{|c_{rh,max} - c_{rh,min}|}{RH_{max} - RH_{min}}$$

and

$c_{rh,max}$ is the average of the individual measurements at the maximum relative humidity,

$c_{rh,min}$ is the average of the individual measurements at the minimum relative humidity,

RH_{max} is the maximum relative humidity (in units of %RH),

RH_{min} is the minimum relative humidity (in units of %RH).

The relative uncertainty contribution, u_{rh} , (in units of $\mu\text{g m}^{-3}$) was required to be calculated from:

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

$$u_{rh} = \frac{b_{rh}}{2\sqrt{3}}$$

The correct units were achieved by removing the contribution of relative humidity, $(RH_{max} - RH_{min})$, introduced above to b_{rh} .

The performance criterion, K , expressed as a percentage was calculated from:

$$K = \frac{u_{rh}}{C_{span}} \cdot 100$$

where the uncertainty is expressed in units of $\mu\text{g m}^{-3}$, and the relevant concentration, C_{span} , was the span concentration used in the test.

Tables 83, 84, 85 and 86 summarise the results obtained from the cross sensitivity to humidity test for all four CAMs at the span concentration.

Tables 87, 88, 89 and 90 summarise the results obtained from the cross sensitivity to humidity test for all four CAMs at $1/10^{\text{th}}$ the limit concentration.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 83: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).										
	ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
Without Interferrent	07/09/2011 06:14	48.23	43.70	63.45	54.39	50.27	63.16			
	07/09/2011 06:44	48.36	43.76	63.49	54.80	50.72	62.80			
	07/09/2011 07:14	48.39	43.66	63.53	54.77	50.76	63.33			
	07/09/2011 07:44	48.32	43.64	63.44	54.69	50.10	63.63			
	07/09/2011 08:14	48.29	43.63	63.46	54.87	50.71	63.47			
	07/09/2011 08:44	48.29	43.91	63.35	54.59	50.66	63.38			
	MEAN / ug m ⁻³	48.32	43.71	63.45	54.73	50.56	63.45			
With Interferrent	08/09/2011 06:14	47.95	43.81	63.29	54.51	50.53	63.21			
	08/09/2011 06:44	48.04	43.64	63.20	54.75	50.36	63.68			
	08/09/2011 07:14	48.01	43.83	63.36	54.35	50.23	63.53			
	08/09/2011 07:44	47.99	43.56	63.29	54.71	50.91	63.21			
	08/09/2011 08:14	48.02	43.77	63.40	54.97	50.94	63.66			
	08/09/2011 08:44	48.01	43.69	63.39	54.95	50.93	63.39			
	MEAN / ug m ⁻³	48.01	43.71	63.36	54.74	50.75	63.45			
	k / %	0.19	0.001	0.04	0.01	0.11	0.002			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 83 (continued): Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).										
	ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
Without Interferrent	07/09/2011 06:14	58.82	116.91	57.81	62.09	61.95	61.04			
	07/09/2011 06:44	59.26	117.59	58.26	62.33	62.56	61.73			
	07/09/2011 07:14	59.08	117.64	58.02	62.07	62.04	60.86			
	07/09/2011 07:44	59.18	117.77	58.25	62.62	63.10	61.75			
	07/09/2011 08:14	59.15	117.76	58.08	62.16	62.33	61.57			
	07/09/2011 08:44	59.29	119.12	61.58	61.50	62.80	61.71			
	MEAN / ug m ⁻³	59.18	118.07	58.98	62.09	62.57	61.47			
With Interferrent	08/09/2011 06:14	59.25	117.51	57.96	62.36	62.58	61.23			
	08/09/2011 06:44	59.40	118.26	58.56	63.03	63.31	61.97			
	08/09/2011 07:14	59.43	118.40	58.44	62.82	63.26	61.83			
	08/09/2011 07:44	59.27	117.69	58.18	62.90	63.26	62.04			
	08/09/2011 08:14	59.61	118.44	58.49	63.22	63.82	62.34			
	08/09/2011 08:44	59.62	118.76	58.68	63.26	63.52	61.93			
	MEAN / ug m ⁻³	59.48	118.32	58.45	63.05	63.47	62.04			
	k / %	0.15	0.06	0.27	0.44	0.42	0.27			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 84: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
Without Interferrent	07/09/2011 06:14	47.38	42.96	62.73	54.09	49.93	62.40		
	07/09/2011 06:44	47.51	43.02	62.76	54.50	50.37	62.04		
	07/09/2011 07:14	47.53	42.92	62.81	54.46	50.41	62.57		
	07/09/2011 07:44	47.47	42.90	62.71	54.39	49.76	62.87		
	07/09/2011 08:14	47.44	42.89	62.73	54.56	50.36	62.71		
	07/09/2011 08:44	47.43	43.16	62.62	54.28	50.31	62.62		
	MEAN / ug m-3	47.47	42.97	62.72	54.42	50.21	62.69		
With Interferrent	08/09/2011 06:14	47.10	43.07	62.57	54.20	50.18	62.46		
	08/09/2011 06:44	47.19	42.90	62.47	54.44	50.02	62.92		
	08/09/2011 07:14	47.16	43.08	62.64	54.05	49.89	62.77		
	08/09/2011 07:44	47.14	42.82	62.56	54.41	50.56	62.46		
	08/09/2011 08:14	47.17	43.03	62.67	54.66	50.59	62.89		
	08/09/2011 08:44	47.17	42.95	62.67	54.64	50.58	62.63		
	MEAN / ug m-3	47.16	42.97	62.64	54.44	50.40	62.69		
	k / %	0.19	0.001	0.04	0.01	0.11	0.002		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 84 (continued): Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).											
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB				
Without Interferrent	07/09/2011 06:14	58.43	115.15	54.42	63.09	61.91	60.53				
	07/09/2011 06:44	58.87	115.82	54.84	63.34	62.52	61.20				
	07/09/2011 07:14	58.69	115.87	54.62	63.07	61.99	60.34				
	07/09/2011 07:44	58.78	115.99	54.83	63.63	63.05	61.23				
	07/09/2011 08:14	58.76	115.99	54.68	63.17	62.29	61.05				
	07/09/2011 08:44	58.90	117.33	57.98	62.49	62.75	61.19				
	MEAN / ug m-3	58.78	116.30	55.53	63.09	62.52	60.95				
With Interferrent	08/09/2011 06:14	58.85	115.74	54.56	63.37	62.53	60.71				
	08/09/2011 06:44	59.01	116.48	55.13	64.05	63.26	61.45				
	08/09/2011 07:14	59.04	116.62	55.01	63.83	63.22	61.30				
	08/09/2011 07:44	58.88	115.92	54.77	63.91	63.22	61.52				
	08/09/2011 08:14	59.22	116.65	55.06	64.24	63.78	61.81				
	08/09/2011 08:44	59.22	116.97	55.25	64.28	63.48	61.41				
	MEAN / ug m-3	59.09	116.54	55.02	64.07	63.42	61.51				
k / %		0.15	0.06	0.25	0.45	0.41	0.26				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 85: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).		BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Without Interferrent	ug m-3					
	07/09/2011 06:14	43.84	50.97	60.00	119.96	58.68
	07/09/2011 06:44	43.90	51.28	60.16	120.41	59.01
	07/09/2011 07:14	43.83	51.04	60.24	120.21	58.64
	07/09/2011 07:44	43.92	51.20	59.94	119.51	58.46
	07/09/2011 08:14	43.26	50.52	59.17	118.14	57.99
	07/09/2011 08:44	43.16	50.31	58.90	117.33	57.98
	MEAN / ug m-3	43.54	50.77	59.56	118.80	58.27
With Interferrent	08/09/2011 06:14	43.02	50.66	59.83	119.53	59.14
	08/09/2011 06:44	43.00	50.43	59.25	118.49	58.07
	08/09/2011 07:14	42.53	49.69	58.58	117.02	57.45
	08/09/2011 07:44	42.65	49.38	58.23	116.61	56.86
	08/09/2011 08:14	42.23	49.34	57.88	115.81	56.63
	08/09/2011 08:44	42.11	48.89	57.83	115.35	56.82
	MEAN / ug m-3	42.38	49.32	58.13	116.19	56.94
	k / %	0.78	0.83	0.70	0.64	0.66

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 86: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).		BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Without Interferrent	ug m-3					
	07/09/2011 06:14	43.63	50.71	59.35	118.01	58.31
	07/09/2011 06:44	43.67	50.90	59.49	118.49	58.51
	07/09/2011 07:14	43.52	50.91	59.52	118.56	58.55
	07/09/2011 07:44	43.78	50.93	59.49	118.35	58.40
	07/09/2011 08:14	43.31	50.53	59.14	117.66	58.03
	07/09/2011 08:44	43.16	50.31	58.90	117.33	57.98
	MEAN / ug m-3	43.45	50.67	59.26	117.97	58.24
With Interferrent	08/09/2011 06:14	42.16	49.81	58.65	116.82	58.19
	08/09/2011 06:44	42.01	49.61	58.36	116.26	57.94
	08/09/2011 07:14	41.95	49.36	58.04	115.46	57.55
	08/09/2011 07:44	41.79	49.13	57.87	115.31	57.48
	08/09/2011 08:14	41.56	48.93	57.61	114.64	57.13
	08/09/2011 08:44	41.55	48.91	57.65	114.55	57.09
	MEAN / ug m-3	41.71	49.08	57.79	114.99	57.31
	k / %	1.16	0.91	0.72	0.73	0.46

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 87: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
Without Interferrent	07/09/2011 06:14	0.60	0.47	0.69	0.62	0.63	0.73		
	07/09/2011 06:44	0.61	0.48	0.66	0.62	0.60	0.72		
	07/09/2011 07:14	0.58	0.47	0.68	0.61	0.61	0.74		
	07/09/2011 07:44	0.58	0.48	0.70	0.64	0.61	0.72		
	07/09/2011 08:14	0.59	0.47	0.74	0.62	0.61	0.71		
	07/09/2011 08:44	0.54	0.49	0.72	0.62	0.57	0.71		
	MEAN / ug m-3	0.57	0.48	0.71	0.62	0.60	0.72		
With Interferrent	08/09/2011 06:14	0.59	0.49	0.67	0.63	0.56	0.72		
	08/09/2011 06:44	0.58	0.47	0.71	0.64	0.55	0.74		
	08/09/2011 07:14	0.56	0.48	0.70	0.61	0.62	0.73		
	08/09/2011 07:44	0.58	0.49	0.67	0.56	0.63	0.74		
	08/09/2011 08:14	0.56	0.48	0.67	0.62	0.61	0.73		
	08/09/2011 08:44	0.59	0.49	0.69	0.66	0.59	0.77		
	MEAN / ug m-3	0.57	0.49	0.68	0.61	0.61	0.74		
	k / %	0.04	0.49	1.03	0.45	0.58	0.83		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 87 (continued): Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
Without Interferrent	07/09/2011 06:14	0.69	1.35	0.67	0.72	0.82	0.64		
	07/09/2011 06:44	0.67	1.41	0.70	0.74	0.84	0.65		
	07/09/2011 07:14	0.68	1.36	0.75	0.69	0.78	0.69		
	07/09/2011 07:44	0.65	1.37	0.63	0.67	0.75	0.70		
	07/09/2011 08:14	0.72	1.40	0.69	0.75	0.83	0.64		
	07/09/2011 08:44	0.67	1.33	0.66	0.71	0.71	0.69		
	MEAN / ug m-3	0.68	1.36	0.68	0.70	0.77	0.68		
With Interferrent	08/09/2011 06:14	0.71	1.37	0.67	0.69	0.94	0.65		
	08/09/2011 06:44	0.68	1.40	0.77	0.73	0.75	0.71		
	08/09/2011 07:14	0.66	1.34	0.65	0.69	0.80	0.68		
	08/09/2011 07:44	0.72	1.34	0.66	0.67	0.88	0.67		
	08/09/2011 08:14	0.67	1.37	0.73	0.70	0.87	0.76		
	08/09/2011 08:44	0.71	1.40	0.66	0.73	0.79	0.79		
	MEAN / ug m-3	0.69	1.36	0.68	0.70	0.84	0.73		
	k / %	0.52	0.01	0.23	0.32	2.73	1.94		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 88: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).		ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
		07/09/2011 06:14	0.55	0.46	0.74	0.62	0.55	0.72
Without Interferrent		07/09/2011 06:44	0.54	0.48	0.75	0.62	0.56	0.70
		07/09/2011 07:14	0.54	0.49	0.72	0.59	0.57	0.71
		07/09/2011 07:44	0.55	0.46	0.75	0.62	0.54	0.72
		07/09/2011 08:14	0.55	0.49	0.73	0.60	0.54	0.71
		07/09/2011 08:44	0.54	0.49	0.72	0.62	0.57	0.71
		MEAN / ug m-3	0.55	0.48	0.73	0.61	0.55	0.71
With Interferrent		08/09/2011 06:14	0.55	0.48	0.73	0.60	0.56	0.70
		08/09/2011 06:44	0.55	0.45	0.73	0.61	0.56	0.72
		08/09/2011 07:14	0.53	0.49	0.70	0.61	0.55	0.71
		08/09/2011 07:44	0.55	0.47	0.74	0.58	0.56	0.68
		08/09/2011 08:14	0.55	0.49	0.71	0.60	0.53	Not Recognised
		08/09/2011 08:44	0.54	0.47	0.72	0.58	0.54	0.69
		MEAN / ug m-3	0.54	0.48	0.72	0.59	0.55	0.52
		k / %	0.19	0.13	0.54	0.64	0.48	0.86

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 88 (continued): Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
Without Interferrent	07/09/2011 06:14	0.67	1.32	0.00	0.71	0.72	Not Recognised		
	07/09/2011 06:44	0.67	1.29	0.66	0.69	0.70	Not Recognised		
	07/09/2011 07:14	0.67	1.32	0.66	0.72	0.70	Not Recognised		
	07/09/2011 07:44	0.67	1.30	Not Recognised	0.70	0.70	Not Recognised		
	07/09/2011 08:14	0.66	1.32	0.64	0.73	0.71	Not Recognised		
	07/09/2011 08:44	0.67	1.33	0.66	0.71	0.71	Not Recognised		
	MEAN / ug m-3	0.66	1.32	0.65	0.72	0.70	Not Recognised		
With Interferrent	08/09/2011 06:14	0.65	1.27	0.68	0.70	0.82	Not Recognised		
	08/09/2011 06:44	0.65	1.30	0.64	0.71	0.84	Not Recognised		
	08/09/2011 07:14	0.67	1.30	0.65	0.72	0.74	Not Recognised		
	08/09/2011 07:44	0.65	1.29	0.67	0.70	0.75	Not Recognised		
	08/09/2011 08:14	0.64	1.31	Not Recognised	0.70	0.69	Not Recognised		
	08/09/2011 08:44	0.64	1.26	0.66	0.74	0.88	Not Recognised		
	MEAN / ug m-3	0.65	1.29	0.66	0.72	0.76	Not Recognised		
	k / %	0.69	0.64	0.21	0.02	2.46	Not Recognised		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 89: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Without Interferrent	07/09/2011 06:14	0.48	0.58	0.65	1.33	0.63
	07/09/2011 06:44	0.54	0.60	0.68	1.33	0.65
	07/09/2011 07:14	0.50	0.57	0.67	1.35	0.65
	07/09/2011 07:44	0.48	0.59	0.64	1.32	0.65
	07/09/2011 08:14	0.48	0.56	0.66	1.34	0.63
	07/09/2011 08:44	0.49	0.57	0.67	1.33	0.66
	MEAN / ug m-3	0.49	0.57	0.66	1.34	0.65
With Interferrent	08/09/2011 06:14	0.46	0.55	0.64	1.31	0.61
	08/09/2011 06:44	0.47	0.58	0.63	1.30	0.61
	08/09/2011 07:14	0.45	0.56	0.66	1.32	0.60
	08/09/2011 07:44	0.48	0.55	0.64	1.27	0.64
	08/09/2011 08:14	0.47	0.55	0.64	1.31	0.61
	08/09/2011 08:44	0.47	0.59	0.65	1.29	0.64
	MEAN / ug m-3	0.47	0.56	0.65	1.30	0.62
k / %		1.19	0.43	0.63	0.81	1.04

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 90: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE			
Without Interferrent	07/09/2011 06:14	0.48	0.58	0.65	1.32	0.65			
	07/09/2011 06:44	0.49	0.58	0.67	1.33	0.65			
	07/09/2011 07:14	0.49	0.58	0.64	1.32	0.63			
	07/09/2011 07:44	0.49	0.58	0.64	1.32	0.64			
	07/09/2011 08:14	0.50	0.57	0.67	1.33	0.65			
	07/09/2011 08:44	0.49	0.57	0.67	1.33	0.66			
	MEAN / ug m-3	0.49	0.57	0.66	1.33	0.64			
With Interferrent	08/09/2011 06:14	0.48	0.56	0.62	1.26	0.63			
	08/09/2011 06:44	0.48	0.55	0.62	1.27	0.62			
	08/09/2011 07:14	0.50	0.58	0.64	1.29	0.62			
	08/09/2011 07:44	0.50	0.55	0.62	1.26	0.61			
	08/09/2011 08:14	0.50	0.54	0.61	1.26	0.62			
	08/09/2011 08:44	0.49	0.56	0.65	1.29	0.64			
	MEAN / ug m-3	0.50	0.56	0.63	1.27	0.62			
k / %		0.14	0.96	1.20	1.15	0.88			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.9.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.10 Cross interference with organic compounds (B10)

5.10.1 Minimum requirement

Yes. MCERTS pass/fail performance criterion

Influence of the interference from the sum of possible interfering organic compounds at the span concentration value (between 70 % and 90 % of the certification range) of benzene,

$$b_{c_{org}} < 5 \%$$

5.10.2 Additional requirements

Determine influence of the interference from the sum of possible interfering organic compounds at 1/10 of the annual mean concentration limit value for benzene.

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6).

5.10.3 Equipment

A gas blending system, test gases at suitable concentrations, a test gas chamber and manifold to distribute the determinand and interferent mixtures to the CAMs,

5.10.4 Testing

This test was carried out at 1/10 of the limit value of benzene, namely $0.5 \mu\text{g m}^{-3}$ (0.15 ppb), and also at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other hydrocarbon determinands involved in the test employed a known concentration of nominally 0.15 ppb and 13.9 ppb.

The ten potential organic cross interferents were: methylcyclopentane, 2,2,3-trimethylbutane, 2,4-dimethylpentane, tetrachloromethane, cyclohexane, 2,3-dimethylpentane, 2-methylhexane, 3-ethylpentane, trichloroethylene, n-heptane. The cross interferents were present at known concentrations of approximately $10 \mu\text{g m}^{-3}$, which corresponds to approximately 2.4 ppb for compounds with a molecular mass of 100 g mol^{-1} . This met the requirement that the concentrations of the interferents were allowed to be in the range $3 \mu\text{g m}^{-3}$ to $10 \mu\text{g m}^{-3}$.

A total of 5 determinand sample injections were carried out at **the lower** determinand concentration without the presence of organic interferents. This was followed by 5 sample injections with the determinand and the cross interferents present simultaneously. The first valid sample result from each group of five was rejected in each case.

Samples with and without the cross interferents were injected, and treated in a similar manner, at the **higher** concentration (span value).

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

A correction to the concentration of the determinand was made for any dilution effect due to the addition of the interferent. The CAMs sampled ambient air before and after the test.

5.10.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

5.10.6 Results

The relative uncertainty from interference of the sum of organic compounds, $u_{C_{org}}$, was calculated from:

$$u_{C_{org}} = \frac{|c_{org} - c|}{\sqrt{3}}$$

where the influence, b_{org} , is given by:

$$b_{org} = \frac{|c_{org} - c|}{c}$$

and

c_{org} is the average of the individual measurements in the presence of the gas mixture selected.

c is the average of the individual measured concentrations without interference.

The performance criterion, K , expressed as a percentage was calculated from

$$K = \frac{u_{org}}{c_{span}} \cdot 100\%$$

Tables 91, 92, 93 and 94 summarise the results for the cross sensitivity to organic compounds test for all four CAMs at the span concentration.

Tables 95, 96, 97 and 98 summarise the results for the cross sensitivity to organic compounds test for all four CAMs at 1/10th the limit concentration.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 91: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).		ug m ⁻³	N-HEPTANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Without Interferent		02/06/2010 10:46	49.44	44.93	65.97	56.15	50.94	63.52
		02/06/2010 11:16	50.59	46.03	67.42	58.12	53.00	66.51
		02/06/2010 11:46	50.63	46.01	67.39	57.96	52.61	67.39
		02/06/2010 12:16	50.19	45.92	67.47	58.03	52.93	67.34
		02/06/2010 12:46	50.41	45.64	67.11	57.89	53.01	66.44
		02/06/2010 13:16	50.29	45.86	67.07	57.75	53.42	66.43
		02/06/2010 13:46	53.83	49.41	72.09	61.59	56.98	71.44
		MEAN / ug m ⁻³	50.38	45.86	67.26	57.91	52.99	66.90
With Interferent		02/06/2010 14:46	22.03	19.81	33.35	28.39	23.11	28.11
		02/06/2010 15:16	48.12	42.30	71.52	61.43	50.55	62.65
		02/06/2010 15:46	47.84	42.40	71.44	61.66	51.27	62.88
		02/06/2010 16:16	47.92	42.25	71.28	61.43	50.31	63.03
		02/06/2010 16:46	47.88	42.14	71.16	61.24	50.37	63.61
		02/06/2010 17:16	47.41	42.06	71.07	60.61	50.13	62.49
		02/06/2010 17:46	47.16	41.83	70.44	61.21	50.33	63.42
		MEAN / ug m ⁻³	47.76	42.21	71.24	61.23	50.52	63.00
		K / %	3.01	4.58	3.43	3.32	2.67	3.39

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 91 (continued): Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
Without Interferent	02/06/2010 10:46	55.94	107.87	51.46	55.97	51.57	46.36		
	02/06/2010 11:16	61.11	119.79	57.46	67.91	65.26	61.16		
	02/06/2010 11:46	62.10	123.44	61.73	70.53	68.30	64.54		
	02/06/2010 12:16	62.24	124.08	62.46	71.33	69.57	66.07		
	02/06/2010 12:46	62.35	125.23	65.86	71.80	70.09	66.78		
	02/06/2010 13:16	62.40	124.31	62.37	72.01	70.60	67.28		
	02/06/2010 13:46	65.23	129.62	64.50	73.29	71.66	67.98		
	MEAN / ug m ⁻³	62.27	124.27	63.11	71.42	69.64	66.17		
With Interferent	02/06/2010 14:46	25.64	48.92	23.19	29.95	28.73	28.55		
	02/06/2010 15:16	57.61	113.18	54.19	64.69	62.90	59.43		
	02/06/2010 15:46	58.82	116.05	55.56	67.62	66.27	63.22		
	02/06/2010 16:16	58.97	117.66	58.91	68.30	67.16	64.12		
	02/06/2010 16:46	58.98	117.65	59.02	68.45	67.32	64.49		
	02/06/2010 17:16	59.00	117.97	60.02	68.84	67.66	64.36		
	02/06/2010 17:46	58.91	118.38	62.45	68.64	67.59	64.72		
	MEAN / ug m ⁻³	58.94	117.33	58.38	68.30	67.10	64.05		
	K / %	3.08	3.22	4.38	2.50	2.08	1.82		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 92: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	N-HEPTANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
Without Interferent	02/06/2010 10:46	50.26	45.24	66.66	56.78	51.39	63.45		
	02/06/2010 11:16	50.83	46.56	67.45	57.78	53.07	66.06		
	02/06/2010 11:46	50.63	46.77	67.20	57.41	53.42	66.15		
	02/06/2010 12:16	50.71	46.01	67.21	57.08	54.53	66.27		
	02/06/2010 12:46	50.94	46.24	67.47	58.48	54.68	67.21		
	02/06/2010 13:16	50.29	45.86	67.07	57.75	53.42	66.43		
	02/06/2010 13:46	54.37	0.00	72.03	0.00	56.60	70.18		
	MEAN / ug m-3	50.64	46.22	67.24	57.68	54.02	66.52		
With Interferent	02/06/2010 14:46	23.16	20.78	33.36	28.85	23.61	29.78		
	02/06/2010 15:16	48.49	43.53	70.93	59.85	51.05	61.96		
	02/06/2010 15:46	48.37	43.37	70.74	58.90	52.08	63.13		
	02/06/2010 16:16	48.43	43.19	70.59	60.86	50.42	63.01		
	02/06/2010 16:46	48.02	43.15	69.79	59.07	51.25	63.28		
	02/06/2010 17:16	47.63	42.88	69.95	58.98	51.76	63.05		
	02/06/2010 17:46	47.07	42.88	69.88	58.85	51.03	62.98		
	MEAN / ug m-3	48.11	43.15	70.27	59.45	51.38	63.12		
	K / %	2.91	3.87	2.61	1.77	2.85	2.95		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 92 (continued): Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).		ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
Without Interferent		02/06/2010 10:46	57.56	112.51	55.74	57.87	53.33	49.35
		02/06/2010 11:16	62.02	124.09	64.95	68.56	65.64	61.86
		02/06/2010 11:46	62.51	123.89	61.99	70.95	68.57	65.12
		02/06/2010 12:16	62.44	124.14	62.13	71.65	69.72	66.40
		02/06/2010 12:46	62.55	125.77	65.93	71.70	69.88	66.99
		02/06/2010 13:16	62.40	124.31	62.37	72.01	70.60	67.28
		02/06/2010 13:46	65.72	129.71	64.94	73.57	71.79	67.93
		MEAN / ug m-3	62.47	124.53	63.11	71.58	69.69	66.45
With Interferent		02/06/2010 14:46	27.47	54.46	27.20	31.32	31.37	30.58
		02/06/2010 15:16	58.29	115.49	57.64	65.12	62.89	60.00
		02/06/2010 15:46	59.36	118.07	59.08	68.19	66.65	63.95
		02/06/2010 16:16	59.37	118.20	59.33	68.56	67.12	64.48
		02/06/2010 16:46	59.50	120.05	62.66	69.16	67.65	64.33
		02/06/2010 17:16	59.17	118.02	59.04	68.93	67.57	64.62
		02/06/2010 17:46	58.94	117.38	58.81	68.69	67.67	64.77
		MEAN / ug m-3	59.35	118.58	60.03	68.71	67.25	64.34
		K / %	2.89	2.76	2.85	2.30	2.00	1.80

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 93: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Without Interferent	02/06/2010 10:46	46.45	52.78	59.02	115.02	56.74
	02/06/2010 11:16	46.23	53.11	62.12	122.40	61.62
	02/06/2010 11:46	47.87	55.11	60.14	118.37	58.89
	02/06/2010 12:16	46.83	53.78	63.41	126.00	63.22
	02/06/2010 12:46	47.81	54.87	60.75	119.82	59.47
	02/06/2010 13:16	45.86	53.42	62.40	124.31	62.37
	02/06/2010 13:46	50.25	54.72	61.59	121.37	59.83
	MEAN / ug m-3	47.09	54.29	61.68	122.13	60.99
With Interferent	02/06/2010 14:46	20.08	25.21	28.21	57.12	25.36
	02/06/2010 15:16	43.18	51.02	59.71	119.06	59.25
	02/06/2010 15:46	42.82	48.49	55.80	111.47	55.24
	02/06/2010 16:16	43.34	51.59	60.88	121.48	60.44
	02/06/2010 16:46	42.77	48.70	56.95	113.83	56.27
	02/06/2010 17:16	42.94	51.96	60.19	120.32	59.85
	02/06/2010 17:46	40.80	47.18	55.84	111.38	55.35
	MEAN / ug m-3	42.97	50.18	58.45	116.77	57.95
	K / %	1.81*	4.44	2.98	2.49	2.81

*Result has been scaled back to reflect the sensitivity coefficient that would have been calculated had the minimum concentration of $3 \mu\text{g m}^{-3}$ of CCl_4 been employed.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 94: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Without Interferent	02/06/2010 10:46	45.39	51.57	56.97	111.55	55.15
	02/06/2010 11:16	45.99	53.58	61.59	121.95	61.22
	02/06/2010 11:46	46.59	53.97	60.69	119.89	60.03
	02/06/2010 12:16	46.15	54.16	62.79	124.84	63.28
	02/06/2010 12:46	46.60	53.87	61.12	120.96	60.27
	02/06/2010 13:16	45.86	53.42	62.40	124.31	62.37
	02/06/2010 13:46	49.42	55.44	63.14	124.23	61.87
	MEAN / ug m-3	46.30	53.85	61.75	122.50	61.49
With Interferent	02/06/2010 14:46	19.85	24.49	28.14	56.67	24.42
	02/06/2010 15:16	44.28	50.87	59.00	117.57	58.29
	02/06/2010 15:46	43.99	49.55	57.47	114.92	57.38
	02/06/2010 16:16	44.45	51.47	60.46	120.84	60.23
	02/06/2010 16:46	43.76	49.45	58.25	116.17	57.62
	02/06/2010 17:16	44.05	51.32	59.94	120.19	59.98
	02/06/2010 17:46	42.76	49.11	57.41	114.93	57.06
	MEAN / ug m-3	44.06	50.45	59.03	118.03	58.80
	K / %	2.81	3.68	2.52	2.08	2.49

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 95: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
		ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
Without Interferent		20/04/2010 11:26	0.48	0.59	0.61	0.79	0.71	0.74	
		20/04/2010 11:56	0.58	0.34	0.81	0.81	0.75	0.68	
		20/04/2010 12:26	0.49	0.59	0.85	1.00	0.76	0.62	
		20/04/2010 12:56	0.63	0.54	0.77	0.88	0.70	0.65	
		20/04/2010 13:26	0.53	0.48	0.74	0.86	0.75	0.62	
		20/04/2010 13:56	0.55	0.50	0.73	0.63	0.58	0.72	
		20/04/2010 14:26	0.45	0.53	0.81	0.84	0.62	0.64	
		MEAN / ug m ⁻³	0.55	0.53	0.77	0.84	0.70	0.65	
With Interferent		20/04/2010 14:56	0.56	0.41	0.00	9.53	0.66	0.72	
		20/04/2010 15:26	0.54	0.42	0.00	9.62	0.63	0.66	
		20/04/2010 15:56	0.54	0.42	0.00	10.08	0.73	0.70	
		20/04/2010 16:26	0.54	0.89	0.00	9.32	0.47	0.65	
		20/04/2010 16:56	0.56	0.32	0.00	9.62	0.48	0.61	
		20/04/2010 17:26	0.43	0.41	0.00	9.99	0.30	0.80	
		20/04/2010 17:56	0.51	0.39	0.00	9.25	0.50	0.56	
		MEAN / ug m ⁻³	0.52	0.51	0.00	9.75	0.49	0.69	
		K / %	3.50	2.13	61.10	816.81	20.16	3.10	

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 95 (continued): Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
Without Interferent	20/04/2010 11:26	0.62	1.55	0.74	0.91	1.02	0.84		
	20/04/2010 11:56	0.75	1.56	0.88	0.84	0.90	0.91		
	20/04/2010 12:26	0.73	1.41	0.75	0.86	0.77	0.89		
	20/04/2010 12:56	0.74	1.35	0.67	0.84	0.90	0.88		
	20/04/2010 13:26	0.76	1.36	0.69	0.82	0.60	0.79		
	20/04/2010 13:56	0.68	1.36	0.68	0.79	0.77	0.73		
	20/04/2010 14:26	0.72	1.35	0.80	0.86	0.76	0.84		
	MEAN / ug m ⁻³	0.73	1.37	0.70	0.83	0.76	0.82		
With Interferent	20/04/2010 14:56	0.63	1.49	0.71	0.81	0.67	0.86		
	20/04/2010 15:26	0.71	1.39	0.78	0.76	0.59	0.66		
	20/04/2010 15:56	0.66	1.43	1.22	0.81	0.59	0.56		
	20/04/2010 16:26	0.71	1.36	0.80	0.73	0.72	0.60		
	20/04/2010 16:56	0.69	1.46	0.66	0.69	0.76	0.77		
	20/04/2010 17:26	0.57	1.34	0.66	0.65	0.83	0.72		
	20/04/2010 17:56	0.74	1.17	0.71	0.63	0.58	0.66		
	MEAN / ug m ⁻³	0.66	1.40	0.83	0.72	0.72	0.66		
	K / %	5.86	1.24	11.35	7.81	2.46	12.64		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 96: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m ⁻³	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE		
Without Interferent	20/04/2010 11:26	0.54	0.53	0.73	0.67	0.62	0.77		
	20/04/2010 11:56	0.56	0.53	0.72	0.67	0.55	0.75		
	20/04/2010 12:26	0.55	0.56	0.74	0.64	0.58	0.74		
	20/04/2010 12:56	0.56	0.49	0.72	0.65	0.58	0.74		
	20/04/2010 13:26	0.60	0.52	0.74	0.63	0.57	0.75		
	20/04/2010 13:56	0.55	0.50	0.73	0.63	0.58	0.72		
	20/04/2010 14:26	0.58	0.52	0.73	0.65	0.60	0.73		
	MEAN / ug m ⁻³	0.57	0.52	0.73	0.64	0.58	0.74		
With Interferent	20/04/2010 14:56	0.62	0.39	0.00	7.35	0.56	0.72		
	20/04/2010 15:26	0.61	0.38	0.00	7.40	0.56	0.73		
	20/04/2010 15:56	0.63	0.38	0.00	7.38	0.59	0.71		
	20/04/2010 16:26	0.60	0.37	0.00	7.40	0.56	0.71		
	20/04/2010 16:56	0.60	0.39	0.00	7.32	0.54	0.72		
	20/04/2010 17:26	0.61	0.39	0.00	7.31	0.52	0.76		
	20/04/2010 17:56	0.62	0.37	0.00	7.28	0.51	0.70		
	MEAN / ug m ⁻³	0.61	0.38	0.00	7.35	0.55	0.72		
	K / %	4.66	15.48	57.83	615.48	2.40	1.16		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 96 (continued): Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m ⁻³	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB		
Without Interferent	20/04/2010 11:26	0.72	1.48	0.71	0.90	1.03	1.10		
	20/04/2010 11:56	0.69	1.40	0.71	0.85	0.92	0.97		
	20/04/2010 12:26	0.66	1.41	0.69	0.82	0.88	0.78		
	20/04/2010 12:56	0.67	1.40	0.69	0.79	0.86	0.77		
	20/04/2010 13:26	0.70	1.37	0.67	0.80	0.81	0.70		
	20/04/2010 13:56	0.68	1.36	0.68	0.79	0.77	0.73		
	20/04/2010 14:26	0.68	1.37	0.68	0.78	0.82	0.63		
	MEAN / ug m ⁻³	0.68	1.38	0.68	0.80	0.83	0.75		
With Interferent	20/04/2010 14:56	0.67	1.31	0.67	0.75	0.80	0.63		
	20/04/2010 15:26	0.70	1.32	0.67	0.75	0.76	0.60		
	20/04/2010 15:56	0.63	1.33	0.66	0.77	0.79	0.58		
	20/04/2010 16:26	0.66	1.31	0.65	0.74	0.77	0.58		
	20/04/2010 16:56	0.67	1.31	0.65	0.74	0.72	0.57		
	20/04/2010 17:26	0.67	1.30	0.64	0.75	0.77	0.59		
	20/04/2010 17:56	0.64	1.28	0.65	0.72	0.73	0.59		
	MEAN / ug m ⁻³	0.66	1.31	0.65	0.75	0.76	0.58		
	K / %	1.83	3.09	2.63	3.72	5.18	13.09		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 97: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).									
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE			
Without Interferent	20/04/2010 11:26	0.66	0.60	0.67	1.32	1.14			
	20/04/2010 11:56	0.54	0.58	0.68	1.36	0.78			
	20/04/2010 12:26	0.52	0.59	0.66	1.31	0.69			
	20/04/2010 12:56	0.51	0.58	0.68	1.35	0.68			
	20/04/2010 13:26	0.52	0.56	0.64	1.26	0.63			
	20/04/2010 13:56	0.50	0.58	0.68	1.36	0.68			
	20/04/2010 14:26	0.50	0.56	0.64	1.26	0.63			
	MEAN / ug m-3	0.51	0.58	0.67	1.32	0.67			
With Interferent	20/04/2010 14:56	0.48	0.58	0.66	1.33	0.66			
	20/04/2010 15:26	0.47	0.54	0.62	1.21	0.60			
	20/04/2010 15:56	0.48	0.57	0.66	1.30	0.65			
	20/04/2010 16:26	0.46	0.54	0.62	1.21	0.60			
	20/04/2010 16:56	0.47	0.55	0.65	1.29	0.64			
	20/04/2010 17:26	0.46	0.52	0.61	1.20	0.59			
	20/04/2010 17:56	0.46	0.56	0.65	1.30	0.64			
	MEAN / ug m-3	0.46	0.55	0.63	1.25	0.62			
K / %		5.44	3.14	2.66	2.81	4.21			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 98: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).						
	ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Without Interferent	20/04/2010 11:26	0.76	0.59	0.69	1.36	1.78
	20/04/2010 11:56	0.53	0.59	0.70	1.39	0.89
	20/04/2010 12:26	0.50	0.57	0.69	1.36	0.73
	20/04/2010 12:56	0.50	0.57	0.69	1.37	0.72
	20/04/2010 13:26	0.51	0.59	0.67	1.32	0.68
	20/04/2010 13:56	0.50	0.58	0.68	1.36	0.68
	20/04/2010 14:26	0.49	0.58	0.66	1.31	0.67
	MEAN / ug m-3	0.50	0.58	0.68	1.35	0.70
With Interferent	20/04/2010 14:56	0.51	0.58	0.67	1.33	0.66
	20/04/2010 15:26	0.49	0.56	0.65	1.26	0.64
	20/04/2010 15:56	0.49	0.57	0.67	1.32	0.66
	20/04/2010 16:26	0.49	0.58	0.66	1.29	0.64
	20/04/2010 16:56	0.49	0.57	0.66	1.31	0.65
	20/04/2010 17:26	0.48	0.57	0.64	1.27	0.64
	20/04/2010 17:56	0.49	0.57	0.65	1.33	0.66
	MEAN / ug m-3	0.49	0.57	0.66	1.30	0.65
	K / %	1.56	0.50	2.14	2.27	4.68

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

5.10.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6. Field test results

The results of the individual performance characteristic tests are given in the following sub-sections.

6.1 Operational Requirements (C1)

The calibration/drift tests were carried out at the span value (between 70% and 90% of certification range) of benzene, nominally $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test had a nominal concentration of 13.9 ppb.

A total of 5 valid determinand sample injections were carried out every two days for the first 14 days of the field tests. The first sample result was rejected in each case. The CAM sampled outside ambient air at all times when span measurements were not being carried out, using the same protocol as above. See Ref 1, clause 8.6.4.

For the duration of the field test, no zero and span adjustments were made to the CAM as this would have influenced the determination of the long term drift. The measurement data from the CAM was only corrected numerically, assuming a linear drift since the previous zero and span check.

For the following five 14 day periods a total of 5 valid determinand sample injections were carried out every 14 days. The first sample result was rejected. The CAM sampled ambient air at times when span calibration measurements were not being carried out, using the same protocol as above. See Ref 1, clause 8.6.4.

During the field trial period a butanol leak was detected from a nearby condensation particle counter. Data that coincided with these periodic leaks was removed.

A power outage occurred during the field trial period. Data gathered during this period was discarded.

6.2 Long term drift (C2)

6.2.1 Minimum requirements

Yes. MCERTS pass/fail performance criterion:

Long term drift, determined at the span value over 14 days $d_{14d} < \pm 10 \%$

6.2.2 Additional requirements

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.2.3 Equipment

Test gasses at suitable concentrations, a test gas manifold to distribute the determinand mixtures to the CAMs.

6.2.4 Evaluation

The data was analysed using the method defined in Section 5.1.5.

6.2.5 Results

Measurements obtained in C1 every 14 days at the span value (between 70% and 90% of certification range) of benzene, nominally $45 \mu\text{g m}^{-3}$ (13.9 ppb) were made use of. All other determinands involved in the test had a nominal concentration of 13.9 ppb.

A total of 5 **valid** determinand sample injections were employed for each measurement. **The first sample result was rejected.** The CAM sampled outside ambient air at times when span measurements were not being carried out.

The long term drift at span level, d_{14d} , (as a percentage) was calculated from:

$$d_{14d} = \frac{|c_n - c_{n-1}|}{c_n} \cdot 100\%$$

c_n = the average of 4 independent measurements at the beginning of the drift period

c_{n-1} = the average of 4 independent measurements at the end of the drift period (14 days)

The largest value of the drift complied with the requirements detailed in Ref 1, clause 8.6.5 and Table 5.

The uncertainty, u_d , due to the long term drift at the span value was calculated using:

$$u_d = \frac{|c_n - c_{n-1}|}{2\sqrt{3}}$$

c_n = the average of 4 independent measurements at the beginning of the drift period

c_{n-1} = the average of 4 independent measurements at the end of the drift period (14 days)

Tables 99, 100, 101 and 102 summarise the results obtained for all four CAMs tested under field test conditions.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 99: Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)							
Drift / %	Test Number	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	1	1.76	1.46	1.95	2.09	1.94	1.45
	2	0.27	4.42	0.16	0.92	0.00	0.42
	3	0.49	0.49	0.22	0.19	0.36	0.49
	4	0.15	0.17	0.05	0.01	0.24	0.05
	5	4.42	3.70	3.93	3.87	3.50	3.89
	6	1.54	1.22	1.59	1.50	1.35	1.44
Maximum Drift / %		4.42	4.42	3.93	3.87	3.50	3.89

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 99 (continued): Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)											
Test Number	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB					
1	1.95	1.81	1.70	2.38	2.37	2.61					
2	4.76	4.89	4.83	7.02	7.20	7.06					
3	0.29	0.76	0.81	0.31	0.25	0.62					
4	0.18	0.39	0.70	0.16	0.09	0.70					
5	3.25	3.87	4.28	0.75	0.76	0.59					
6	1.49	1.76	1.43	2.87	3.72	3.33					
Drift / %	4.76	4.89	4.83	7.02	7.20	7.06					
Maximum Drift / %											

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 100: Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)							
Drift / %	Test Number	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
	1	0.75	1.54	0.68	0.88	1.08	0.66
	2	0.70	0.12	0.80	0.34	3.90	0.90
	3	0.03	0.12	0.11	0.00	1.01	0.26
	4	0.27	0.31	0.29	0.83	1.59	0.16
	5	1.09	1.49	0.93	0.48	0.40	0.93
	6	0.50	0.33	1.00	0.86	0.63	0.88
Maximum Drift / %		1.09	1.54	1.00	0.88	3.90	0.93

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 100 (continued): Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)							
Drift / %	Test Number	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
	1	0.47	0.49	0.77	0.38	0.08	0.19
	2	0.19	0.86	1.32	0.79	0.47	0.38
	3	1.29	0.51	0.16	0.77	1.43	1.66
	4	0.06	0.21	0.50	0.81	1.31	1.58
	5	0.47	0.95	1.11	0.86	0.59	0.55
	6	0.00	0.64	0.09	0.87	0.74	0.88
Maximum Drift / %		1.29	0.95	1.32	0.87	1.43	1.66

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 101: Long term drift results for Chromatotec GC 866 FID airToxic (Model A73022, serial number 20430309), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Long term drift results for Chromatotec GC 866 PID air Toxic (Model A73022, serial number 20430309) carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)						
Drift / %	Test Number	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	1	1.80	0.35	0.41	0.85	1.14
	2	2.31	1.97	0.80	0.40	0.28
	3	6.74	4.76	5.44	4.93	5.48
	4	0.52	2.62	3.10	2.63	2.30
	5	5.75	5.47	5.55	4.63	5.10
	6	7.52	3.54	4.27	3.88	3.98
Maximum Drift / %		7.52	5.47	5.55	4.93	5.48

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 102: Long term drift results for Chromatotec GC 866 FID airToxic (Model A73022, serial number 20720509), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Long term drift results for Chromatotec GC 866 PID air Toxic (Model A73022, serial number 20720509) carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)						
Drift / %	Test Number	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	1	2.80	1.26	0.73	0.40	0.30
	2	0.69	2.36	1.75	1.48	1.58
	3	0.90	0.59	1.48	1.43	1.57
	4	1.32	1.70	1.48	1.03	0.86
	5	4.68	3.81	3.95	3.20	3.42
	6	1.69	2.01	1.25	1.33	1.30
Maximum Drift / %		4.68	3.81	3.95	3.20	3.42

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.2.6 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.3 Maintenance interval (C3)

6.3.1 Minimum requirements

Yes. MCERTS pass/fail criterion:

Maintenance interval determined over the field trial period > 14 days.

6.3.2 Additional requirements

Similar performance characteristics and performance criteria apply to the additional species requested by Chromatotec to be tested (see Section 1.2.6)

6.3.3 Equipment

Test gas manifold to distribute ambient air to the CAMs.

6.3.4 Results

This shall be at least 2 weeks, but could be the duration of the field test (3 months) or a shorter period of time from the start of the field test until any malfunction occurs. See Ref 1, clause 8.6.6 and Table 5. The manufacturer will advise on the minimum time period required. During this period the CAMs shall not need any regular maintenance or adjustment.

Table 103 summarizes the maintenance interval for all four CAMs.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 103: Maintenance interval for all four Chromatotec GCs

Maintenance interval for all four Chromatotec GCs							
Maintenance Interval / days	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE	
GC FID 1	90.0	90.0	90.0	90.0	90.0	90.0	
GC FID 2	90.0	90.0	90.0	90.0	90.0	90.0	
GC PID 3		90.0			90.0		
GC PID 4		90.0			90.0		

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 103 (continued): Maintenance interval for all four Chromatotec GCs

Maintenance interval for all four Chromatotec GCs									
Maintenance Interval / days	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
GC FID 1	90.0	90.0	90.0	90.0	90.0	80.0			
GC FID 2	90.0	90.0	90.0	90.0	90.0	90.0			
GC PID 3	90.0	90.0	90.0						
GC PID 4	90.0	90.0	90.0						

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.3.5 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene ; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.4 Availability (C4)

6.4.1 Minimum requirements

Yes. MCERTS pass/fail criterion:

Availability, determined at ambient concentrations over the field trial period $A_a > 90\%$

6.4.2 Additional requirements

Similar performance characteristics and performance criteria apply to the additional species requested by Chromatotec to be tested (see Section 1.2.6)

6.4.3 Equipment

Test gas manifold to distribute ambient air to the CAMs.

6.4.5 Evaluation

The data was analysed using the method defined in Section 5.1.5.

6.4.6 Results

Checks on the correct operation were carried out at least every 14 days.

The time, duration of abnormalities were recorded. See Ref 1, clause 8.6.7 and Table 5.

The total time during the field test for which valid data of ambient air concentrations were obtained was used to calculate the availability.

Time needed for calibrations, conditioning, and maintenance was not included in the field test period.

The data coverage was calculated from:

$$A_a = \frac{t_u}{t_t} \cdot 100\%$$

t_u = the total time period with validated data

t_t = the time period of the field test minus the time spent on zero and span check, maintenance and other invalid data.

Tables 103, 104, 105 and 106 summarise the results obtained for all four CAMs tested under field test conditions.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 104: Availability results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Availability results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)						
	N-HEPTANE	I-OCTANE	BENZENE	N-HEPTANE	TOLUENE	N-OCTANE
Availability / %	85.8	67.5	99.7	77.7	100.0	57.8
	ETHYLBENZENE	O-XYLENE	M&P-XYLENES	135-TMB	124-TMB	123-TMB
Availability / %	96.8	99.5	99.8	89.7	99.9	70.7

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 105: Availability results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Availability results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)						
	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE
Availability / %	96.8	99.8	99.5	89.7	99.9	70.7
	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB
Availability / %	96.8	99.8	99.5	89.7	99.9	70.7

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 106: Availability results for Chromatotec GC 866 PID airmoVOC (Model A21022, serial number 20430309)

Availability results for Chromatotec GC 866 PID air Toxic (Model A73022, serial number 20430309)					
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Availability / %	100.0	99.9	96.1	99.9	98.8

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 107: Availability results for Chromatotec GC 866 PID airmoVOC (Model A21022, serial number 20720509)

Availability results for Chromatotec GC 866 PID air Toxic (Model A73022, serial number 20720509)						
		BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
Availability / %		99.9	99.9	96.0	99.8	97.7

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.4.7 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,2,4-trimethylbenzene

Additional performance criterion **not met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; n-heptane; n-octane; ethyl-benzene; 1,3,5-trimethylbenzene; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; toluene; ethyl-benzene; m-xylene; p-xylene; o-xylene; 1,2,4-trimethylbenzene

Additional performance criterion **not met** for the determinands: n-heptane; n-octane; 1,3,5-trimethylbenzene; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.5 Reproducibility standard deviation under field conditions (C5)

6.5.1 Minimum requirements

Yes. MCERTS pass/fail performance criterion:

Reproducibility standard deviation, determined at ambient concentrations $s_{RF} < \pm 0.25 \mu\text{g m}^{-3}$

6.5.2 Additional requirements

Similar performance characteristics and performance criteria apply (in units of parts per billion (ppb)) to the additional species requested by Chromatotec to be tested (See Section 1.2.6)

6.5.3 Equipment

Test gases at suitable concentrations, test gas manifold to distribute the determinand mixtures and ambient air to the CAMs.

6.5.4 Evaluation

The data was analysed using the method defined in Section 5.1.5.

6.5.5 Results

The reproducibility standard deviation test was carried out by comparing the ambient measurement data between pairs of CAMs of the same type throughout the 3 month trial.

It did not include measurements of span gases or down time for maintenance. The difference for each parallel measurement, i , was given by:

$$d_{f,i} = (c_{1,f})_i - (c_{2,f})_i$$

The average difference from these measurements was calculated from:

$$\overline{d_f} = \frac{\sum d_{f,i}}{n}$$

$d_{f,i}$ = the i th difference in a parallel measurement,

$(c_{1,f})_i$ = the i th measurement result of analyser 1,

$(c_{2,f})_i$ = the i th measurement result of analyser 2,

n = the number of parallel measurements.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The reproducibility (under field conditions) standard deviation S_{Rf} was calculated according to:

$$S_{Rf} = \sqrt{\sum d_{f,i}^2 / 2n}$$

The standard uncertainty for the reproducibility in the field was given by:

$$u_{Rf} = S_{Rf}$$

Tables 108, 109, 110 and 111 summarise the results obtained for all four CAMs tested under field test conditions.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 108: Reproducibility standard deviation results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Reproducibility standard deviation results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)									
ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
Reproducibility standard deviation	0.26	0.24	0.23	0.78	1.54	1.33			
ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
Reproducibility standard deviation	1.05	2.33	0.42	0.59	2.54	2.89			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 109: Reproducibility standard deviation results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Reproducibility standard deviation results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)									
ug m-3	N-HEXANE	BENZENE	I-OCTANE	N-HEPTANE	TOLUENE	N-OCTANE			
Reproducibility standard deviation	0.26	0.24	0.23	0.78	1.54	1.33			
ug m-3	ETHYLBENZENE	M&P-XYLENES	O-XYLENE	135-TMB	124-TMB	123-TMB			
Reproducibility standard deviation	1.05	2.33	0.42	0.59	2.54	2.89			

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 110: Reproducibility standard deviation results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309)

Reproducibility standard deviation results for Chromatotec GC 866 PID air Toxic (Model A73022, serial number 20430309)					
ug m-3	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	0.08	0.19	0.38	0.22	0.14
Reproducibility standard deviation					

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 111: Reproducibility standard deviation results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

Reproducibility standard deviation results for Chromatotec GC 866 PID air Toxic (Model A73022, serial number 20720509)					
ug m-3					
	BENZENE	TOLUENE	ETHYLBENZENE	M&P-XYLENES	O-XYLENE
	0.08	0.19	0.38	0.22	0.14
	Reproducibility standard deviation				

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.5.6 Assessment

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: 2,2,4-trimethyl pentane

Additional performance criterion **not met** for the determinands: n-hexane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: 2,2,4-trimethyl pentane

Additional performance criterion **not met** for the determinands: n-hexane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene; 1,2,3-trimethylbenzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; m-xylene; p-xylene; o-xylene.

Additional performance criterion **not met** for the determinands: ethyl benzene

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; m-xylene; p-xylene; o-xylene

Additional performance criterion **not met** for the determinands: ethyl benzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.6 Uncertainty Calculation

6.6.1 Minimum requirements

Yes. MCERTS pass/fail performance criterion

The value of the expanded uncertainty for each CAM may not exceed the requirements of the **Directive 2009/69/EC** of the European Parliament and of the Council of 16 November 2000 relating to limit values for **benzene** and carbon monoxide in ambient; Abl. Nr. L313, p.12. This allows for benzene a maximum value of 25% for the expanded uncertainty as percentage in continuous measurements. Note that this criterion is applied the uncertainty calculated from the combination of both lab tests and the field tests.

6.6.2 Additional Requirements

Similar evaluations apply to the additional species requested by Chromatotec to be tested.

6.6.3 Evaluation

The total uncertainty was determined for each CAM using the relevant performance characteristics determined in the laboratory and field tests for the determinand benzene. Although there was no requirement to do so in the **Directive 2009/69/EC** detailed above, a similar treatment was employed for the additional species requested to be tested by Chromatotec.

6.6.4 Results

The total uncertainty calculation was evaluated in two stages. In Stage 1 the calculation was carried out using performance characteristic values determined in the laboratory tests. In Stage 2 the total uncertainty was recalculated by replacing values of the short term drift (measured in the laboratory tests) with values of the long-term drift (measured during the field tests), and by replacing values of the repeatability (measured during the laboratory tests) with values of the reproducibility (measured during the field tests).

The combined uncertainty, u_c , was calculated from:

$$u_c = c_{test} \sqrt{\sum \frac{u_i^2}{c_i^2}}$$

where u_c is the combined uncertainty connected to the concentration of benzene c_{test} , and u_i is the partial contribution of the uncertainty at concentration c_i . The expanded uncertainty at the 95% confidence level was calculated by multiplying u_c by a coverage factor of 2.

Table 112 summarizes the uncertainties for each species for each of the four CAMs.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 112: Summary of uncertainties for each species for each of the four CAMs

Performance Characteristic, with benzene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $45.0 \mu\text{g m}^{-3}$)	u_{span}	0.47	0.47
Lack of fit (at $14.98 \mu\text{g m}^{-3}$ and $4.90 \mu\text{g m}^{-3}$)	u_{fit}	0.073	0.061
Repeatability standard deviation (at $4.98 \mu\text{g m}^{-3}$)	u_r	0.07	0.04
Interference from ozone (at $36.7 \mu\text{g m}^{-3}$)	u_{O_3}	0.46	0.43
Interference from other organic compounds (at $45.86 \mu\text{g m}^{-3}$)	u_{org}	2.10	1.77
Relative humidity tested at 20% RH and 80% RH (at $43.16 \mu\text{g m}^{-3}$)	u_{rh}	0.0005	0.0005
Surrounding temperature (at $44.08 \mu\text{g m}^{-3}$)	u_{sT}	0.10	0.10
Dependence on sampling pressure (at $5.01 \mu\text{g m}^{-3}$)	u_p	0.15	0.28
Dependence on voltage ($44.4 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.084	0.19
Short-term drift (at $44.6 \mu\text{g m}^{-3}$)	u_s	0.02	0.23
Combined uncertainty	$(u_c/c) / \%$	5.9	7.2
Expanded uncertainty	$U_{c,rel} / \%$	11.8	14.3

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with benzene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $38.97 \mu\text{g m}^{-3}$)	u_{span}	0.39	0.39
Lack of fit (at $14.98 \mu\text{g m}^{-3}$ and $4.90 \mu\text{g m}^{-3}$)	u_{fit}	0.073	0.061
Reproducibility standard deviation (at $5.0 \mu\text{g m}^{-3}$)	u_{rf}	0.24	0.24
Interference from ozone (at $36.7 \mu\text{g m}^{-3}$)	u_{O_3}	0.46	0.43
Interference from other organic compounds (at $45.86 \mu\text{g m}^{-3}$)	u_{org}	2.10	1.77
Relative humidity tested at 20% RH and 80% RH (at $43.16 \mu\text{g m}^{-3}$)	u_{rh}	0.0005	0.0005
Surrounding temperature (at $44.08 \mu\text{g m}^{-3}$)	u_{st}	0.10	0.10
Dependence on sampling pressure (at $5.01 \mu\text{g m}^{-3}$)	u_p	0.15	0.28
Dependence on voltage ($44.4 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.084	0.19
long-term drift (at $39.0 \mu\text{g m}^{-3}$)	u_s	0.21	0.07
Combined uncertainty	$(u_c/c) \%$	7.5	8.6
Expanded uncertainty	$U_{c,rel} \%$	15.0	17.1

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with n-hexane concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $49.6 \mu\text{g m}^{-3}$)	u_{span}	0.52	0.52
Lack of fit (at $5.39 \mu\text{g m}^{-3}$ and $27.3 \mu\text{g m}^{-3}$)	u_{fit}	0.119	0.041
Repeatability standard deviation (at $5.47 \mu\text{g m}^{-3}$)	u_r	0.04	0.02
Interference from ozone (at $40.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.51	0.48
Interference from other organic compounds (at $50.29 \mu\text{g m}^{-3}$)	u_{org}	1.51	1.46
Relative humidity tested at 20% RH and 80% RH (at $47.13 \mu\text{g m}^{-3}$)	u_{rh}	0.09	0.09
Surrounding temperature (at $49.17 \mu\text{g m}^{-3}$)	u_{ST}	0.22	0.09
Dependence on sampling pressure (at $5.50 \mu\text{g m}^{-3}$)	u_p	0.34	NV*
Dependence on voltage ($48.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_V	0.023	0.22
Short-term drift (at $49.0 \mu\text{g m}^{-3}$)	u_s	4.22	0.26
Combined uncertainty	$(u_c/c) \%$	11.3	3.4
Expanded uncertainty	$U_{c,rel} \%$	22.5	6.8

*Uncertainties calculated from numerical values included in tables

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with n-hexane concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $42.71 \mu\text{g m}^{-3}$)	u_{span}	0.43	0.43
Lack of fit (at $5.39 \mu\text{g m}^{-3}$ and $27.3 \mu\text{g m}^{-3}$)	u_{fit}	0.119	0.041
Reproducibility standard deviation (at $5.52 \mu\text{g m}^{-3}$)	u_{rf}	0.26	0.26
Interference from ozone (at $40.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.51	0.48
Interference from other organic compounds (at $50.29 \mu\text{g m}^{-3}$)	u_{org}	1.51	1.46
Relative humidity tested at 20% RH and 80% RH (at $47.13 \mu\text{g m}^{-3}$)	u_{rh}	0.09	0.09
Surrounding temperature (at $49.17 \mu\text{g m}^{-3}$)	u_{ST}	0.22	0.09
Dependence on sampling pressure (at $5.50 \mu\text{g m}^{-3}$)	u_p	0.34	NV*
Dependence on voltage ($48.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_V	0.023	0.22
long-term drift (at $42.7 \mu\text{g m}^{-3}$)	u_s	0.18	0.07
Combined uncertainty	$(u_c/c) \%$	8.8	5.8
Expanded uncertainty	$U_{c,rel} \%$	17.6	11.6

*Uncertainties calculated from numerical values included in tables

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 2,2,4-trimethyl pentane concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $65.8 \mu\text{g m}^{-3}$)	u_{span}	0.68	0.68
Lack of fit (at $36.4 \mu\text{g m}^{-3}$ and $36.4 \mu\text{g m}^{-3}$)	u_{fit}	0.074	0.068
Repeatability standard deviation (at $7.29 \mu\text{g m}^{-3}$)	u_r	0.06	0.04
Interference from ozone (at $53.8 \mu\text{g m}^{-3}$)	u_{O_3}	0.61	0.59
Interference from other organic compounds (at $67.07 \mu\text{g m}^{-3}$)	u_{org}	2.30	1.75
Relative humidity tested at 20% RH and 80% RH (at $62.62 \mu\text{g m}^{-3}$)	u_{rh}	0.02	0.02
Surrounding temperature (at $65.58 \mu\text{g m}^{-3}$)	u_{st}	0.37	0.06
Dependence on sampling pressure (at $7.33 \mu\text{g m}^{-3}$)	u_p	0.46	0.44
Dependence on voltage ($64.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.040	0.31
Short-term drift (at $65.2 \mu\text{g m}^{-3}$)	u_s	0.23	0.38
Combined uncertainty	$(u_c/c) \%$	7.4	6.8
Expanded uncertainty	$U_{c,rel} \%$	14.8	13.6

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 2,2,4-trimethyl pentane concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $56.99 \mu\text{g m}^{-3}$)	u_{span}	0.57	0.57
Lack of fit (at $36.4 \mu\text{g m}^{-3}$ and $36.4 \mu\text{g m}^{-3}$)	u_{fit}	0.074	0.068
Reproducibility standard deviation (at $7.31 \mu\text{g m}^{-3}$)	u_{rf}	0.23	0.23
Interference from ozone (at $53.8 \mu\text{g m}^{-3}$)	u_{O_3}	0.61	0.59
Interference from other organic compounds (at $67.07 \mu\text{g m}^{-3}$)	u_{org}	2.30	1.75
Relative humidity tested at 20% RH and 80% RH (at $62.62 \mu\text{g m}^{-3}$)	u_{rh}	0.02	0.02
Surrounding temperature (at $65.58 \mu\text{g m}^{-3}$)	u_{st}	0.37	0.06
Dependence on sampling pressure (at $7.33 \mu\text{g m}^{-3}$)	u_p	0.46	0.44
Dependence on voltage ($64.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.40	0.31
long-term drift (at $57.0 \mu\text{g m}^{-3}$)	u_s	0.22	0.11
Combined uncertainty	$(u_c/c) \%$	8.0	7.4
Expanded uncertainty	$U_{c,rel} \%$	16.0	14.9

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with n-heptane concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $57.7 \mu\text{g m}^{-3}$)	u_{span}	0.60	0.60
Lack of fit (at $31.3 \mu\text{g m}^{-3}$ and $6.20 \mu\text{g m}^{-3}$)	u_{fit}	0.072	0.059
Repeatability standard deviation (at $6.28 \mu\text{g m}^{-3}$)	u_r	0.04	0.04
Interference from ozone (at $46.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.53	0.53
Interference from other organic compounds (at $57.75 \mu\text{g m}^{-3}$)	u_{org}	1.92	1.02
Relative humidity tested at 20% RH and 80% RH (at $54.28 \mu\text{g m}^{-3}$)	u_{rh}	0.005	0.005
Surrounding temperature (at $56.45 \mu\text{g m}^{-3}$)	u_{st}	0.36	0.07
Dependence on sampling pressure (at $6.31 \mu\text{g m}^{-3}$)	u_p	0.38	0.88
Dependence on voltage ($55.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.0094	0.25
Short-term drift (at $56.1 \mu\text{g m}^{-3}$)	u_s	0.06	0.35
Combined uncertainty	$(u_c/c) / \%$	7.1	14.2
Expanded uncertainty	$U_{c,rel} / \%$	14.2	28.41981058

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with n-heptane concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $49.04 \mu\text{g m}^{-3}$)	u_{span}	0.49	0.49
Lack of fit (at $31.3 \mu\text{g m}^{-3}$ and $6.20 \mu\text{g m}^{-3}$)	u_{fit}	0.072	0.059
Reproducibility standard deviation (at $6.42 \mu\text{g m}^{-3}$)	u_{rf}	0.78	0.78
Interference from ozone (at $46.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.53	0.53
Interference from other organic compounds (at $57.75 \mu\text{g m}^{-3}$)	u_{org}	1.92	1.02
Relative humidity tested at 20% RH and 80% RH (at $54.28 \mu\text{g m}^{-3}$)	u_{rh}	0.005	0.005
Surrounding temperature (at $56.45 \mu\text{g m}^{-3}$)	u_{st}	0.36	0.07
Dependence on sampling pressure (at $6.31 \mu\text{g m}^{-3}$)	u_p	0.38	0.88
Dependence on voltage ($55.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.0094	0.25
long-term drift (at $49.0 \mu\text{g m}^{-3}$)	u_s	0.21	0.08
Combined uncertainty	$(u_c/c) / \%$	14.1	18.7
Expanded uncertainty	$U_{crel} / \%$	28.1	37.0

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with toluene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $53.1 \mu\text{g m}^{-3}$)	u_{span}	0.55	0.55
Lack of fit (at $29.0 \mu\text{g m}^{-3}$ and $5.7 \mu\text{g m}^{-3}$)	u_{fit}	0.109	0.138
Repeatability standard deviation (at $5.81 \mu\text{g m}^{-3}$)	u_r	0.17	0.06
Interference from ozone (at $42.8 \mu\text{g m}^{-3}$)	u_{O_3}	0.44	0.49
Interference from other organic compounds (at $53.42 \mu\text{g m}^{-3}$)	u_{org}	1.42	1.52
Relative humidity tested at 20% RH and 80% RH (at $50.31 \mu\text{g m}^{-3}$)	u_{rh}	0.06	0.06
Surrounding temperature (at $52.22 \mu\text{g m}^{-3}$)	u_{ST}	NV*	0.003
Dependence on sampling pressure (at $5.01 \mu\text{g m}^{-3}$)	u_p	0.19	0.18
Dependence on voltage ($51.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_V	0.023	0.20
Short-term drift (at $52.0 \mu\text{g m}^{-3}$)	u_s	0.31	0.20
Combined uncertainty	$(u_c/c) \%$	5.7	5.5
Expanded uncertainty	$U_{crel} \%$	11.4	11.1

*Uncertainties calculated from numerical values included in tables

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with toluene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $45.40 \mu\text{g m}^{-3}$)	u_{span}	0.45	0.45
Lack of fit (at $29.0 \mu\text{g m}^{-3}$ and $5.7 \mu\text{g m}^{-3}$)	u_{fit}	0.109	0.138
Reproducibility standard deviation (at $5.90 \mu\text{g m}^{-3}$)	u_{rf}	1.54	1.54
Interference from ozone (at $42.8 \mu\text{g m}^{-3}$)	u_{O_3}	0.44	0.49
Interference from other organic compounds (at $53.42 \mu\text{g m}^{-3}$)	u_{org}	1.42	1.52
Relative humidity tested at 20% RH and 80% RH (at $50.31 \mu\text{g m}^{-3}$)	u_{rh}	0.06	0.06
Surrounding temperature (at $52.22 \mu\text{g m}^{-3}$)	u_{ST}	NV*	0.003
Dependence on sampling pressure (only the relative deviation is known)	u_p	0.19	0.18
Dependence on voltage ($51.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_V	0.023	0.20
long-term drift (at $45.4 \mu\text{g m}^{-3}$)	u_s	0.16	0.19
Combined uncertainty	$(u_c/c) \%$	26.6	26.7
Expanded uncertainty	$U_{c,rel} \%$	53.1	53.3

*Uncertainties calculated from numerical values included in tables

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with n-octane concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $65.8 \mu\text{g m}^{-3}$)	u_{span}	0.68	0.68
Lack of fit (at $36.1 \mu\text{g m}^{-3}$ and $36.1 \mu\text{g m}^{-3}$)	u_{fit}	0.138	0.068
Repeatability standard deviation (at $7.22 \mu\text{g m}^{-3}$)	u_r	0.18	0.05
Interference from ozone (at $53.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.54	0.55
Interference from other organic compounds (at $66.43 \mu\text{g m}^{-3}$)	u_{org}	2.25	1.96
Relative humidity tested at 20% RH and 80% RH (at $62.62 \mu\text{g m}^{-3}$)	u_{rh}	0.002	0.001
Surrounding temperature (at $64.95 \mu\text{g m}^{-3}$)	u_{st}	0.29	0.07
Dependence on sampling pressure (at $7.26 \mu\text{g m}^{-3}$)	u_p	0.46	0.46
Dependence on voltage ($64.3 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.00021	0.27
Short-term drift (at $64.7 \mu\text{g m}^{-3}$)	u_s	0.67	0.39
Combined uncertainty	$(u_c/c) / \%$	7.4	7.2
Expanded uncertainty	$U_{c,rel} / \%$	14.8	14.4

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with n-octane concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $56.42 \mu\text{g m}^{-3}$)	u_{span}	0.56	0.56
Lack of fit (at $36.1 \mu\text{g m}^{-3}$ and $36.1 \mu\text{g m}^{-3}$)	u_{fit}	0.138	0.068
Reproducibility standard deviation (at $7.31 \mu\text{g m}^{-3}$)	u_{rf}	1.33	1.33
Interference from ozone (at $53.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.54	0.55
Interference from other organic compounds (at $66.43 \mu\text{g m}^{-3}$)	u_{org}	2.25	1.96
Relative humidity tested at 20% RH and 80% RH (at $62.62 \mu\text{g m}^{-3}$)	u_{rh}	0.002	0.001
Surrounding temperature (at $64.95 \mu\text{g m}^{-3}$)	u_{st}	0.29	0.07
Dependence on sampling pressure (at $7.26 \mu\text{g m}^{-3}$)	u_p	0.46	0.46
Dependence on voltage ($64.3 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.00021	0.27
long-term drift (at $56.4 \mu\text{g m}^{-3}$)	u_s	0.21	0.10
Combined uncertainty	$(u_c/c) \%$	19.6	19.5
Expanded uncertainty	$U_{c,rel} \%$	39.3	39.1

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with ethyl-benzene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $61.2 \mu\text{g m}^{-3}$)	u_{span}	0.64	0.64
Lack of fit (at $34.0 \mu\text{g m}^{-3}$ and $34.0 \mu\text{g m}^{-3}$)	u_{fit}	0.081	0.051
Repeatability standard deviation (at $5.47 \mu\text{g m}^{-3}$)	u_r	0.09	0.04
Interference from ozone (at $50.1 \mu\text{g m}^{-3}$)	u_{O_3}	0.55	0.50
Interference from other organic compounds (at $62.40 \mu\text{g m}^{-3}$)	u_{org}	1.92	1.80
Relative humidity tested at 20% RH and 80% RH (at $58.90 \mu\text{g m}^{-3}$)	u_{rh}	0.09	0.09
Surrounding temperature (at $61.06 \mu\text{g m}^{-3}$)	u_{st}	0.39	0.20
Dependence on sampling pressure (at $6.83 \mu\text{g m}^{-3}$)	u_p	0.39	0.37
Dependence on voltage ($60.5 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.042	0.17
Short-term drift (at $60.9 \mu\text{g m}^{-3}$)	u_s	0.29	0.35
Combined uncertainty	$(u_c/c) \%$	6.9	6.4
Expanded uncertainty	$U_{c,rel} \%$	13.8	12.8

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with ethyl-benzene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $53.01 \mu\text{g m}^{-3}$)	u_{span}	0.53	0.53
Lack of fit (at $34.0 \mu\text{g m}^{-3}$ and $34.0 \mu\text{g m}^{-3}$)	u_{fit}	0.081	0.051
Reproducibility standard deviation (at $6.80 \mu\text{g m}^{-3}$)	u_{rf}	1.05	1.05
Interference from ozone (at $50.1 \mu\text{g m}^{-3}$)	u_{O_3}	0.55	0.50
Interference from other organic compounds (at $62.40 \mu\text{g m}^{-3}$)	u_{org}	1.92	1.80
Relative humidity tested at 20% RH and 80% RH (at $58.90 \mu\text{g m}^{-3}$)	u_{rh}	0.09	0.09
Surrounding temperature (at $61.06 \mu\text{g m}^{-3}$)	u_{st}	0.39	0.20
Dependence on sampling pressure (at $6.83 \mu\text{g m}^{-3}$)	u_p	0.39	0.37
Dependence on voltage ($60.5 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.042	0.17
long-term drift (at $53.0 \mu\text{g m}^{-3}$)	u_s	0.31	2.66
Combined uncertainty	$(u_c/c) \%$	16.8	17.4
Expanded uncertainty	$U_{c,rel} \%$	33.7	34.8

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with m- and p-xylene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $122.4 \mu\text{g m}^{-3}$)	u_{span}	1.27	1.27
Lack of fit (at $40.7 \mu\text{g m}^{-3}$ and $40.7 \mu\text{g m}^{-3}$)	u_{fit}	0.24	0.19
Repeatability standard deviation (at $13.5 \mu\text{g m}^{-3}$)	u_r	0.28	0.17
Interference from ozone (at $99.9 \mu\text{g m}^{-3}$)	u_{O_3}	1.11	1.28
Interference from other organic compounds (at $124.31 \mu\text{g m}^{-3}$)	u_{org}	4.00	3.43
Relative humidity tested at 20% RH and 80% RH (at $117.33 \mu\text{g m}^{-3}$)	u_{rh}	0.07	0.07
Surrounding temperature (at $121.82 \mu\text{g m}^{-3}$)	u_{st}	0.40	1.22
Dependence on sampling pressure (at $13.62 \mu\text{g m}^{-3}$)	u_p	0.80	0.74
Dependence on voltage ($120.6 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.15	0.32
Short-term drift (at $121 \mu\text{g m}^{-3}$)	u_s	0.61	0.71
Combined uncertainty	$(u_c/c) \%$	7.2	6.6
Expanded uncertainty	$U_{c,rel} \%$	14.4	13.1

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with m- and p-xylene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $105.6 \mu\text{g m}^{-3}$)	u_{span}	1.06	1.06
Lack of fit (at $40.7 \mu\text{g m}^{-3}$ and $40.7 \mu\text{g m}^{-3}$)	u_{fit}	0.24	0.19
Reproducibility standard deviation (at $13.6 \mu\text{g m}^{-3}$)	u_{rf}	2.33	2.33
Interference from ozone (at $99.1 \mu\text{g m}^{-3}$)	u_{O_3}	1.11	1.28
Interference from other organic compounds (at $124.31 \mu\text{g m}^{-3}$)	u_{org}	4.00	3.43
Relative humidity tested at 20% RH and 80% RH (at $117.33 \mu\text{g m}^{-3}$)	u_{rh}	0.07	0.07
Surrounding temperature (at $121.82 \mu\text{g m}^{-3}$)	u_{st}	0.40	1.22
Dependence on sampling pressure (at $13.62 \mu\text{g m}^{-3}$)	u_p	0.80	0.74
Dependence on voltage ($120.6 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.15	0.32
long-term drift (at $105.6 \mu\text{g m}^{-3}$)	u_s	0.71	0.19
Combined uncertainty	$(u_c/c) / \%$	18.5	18.3
Expanded uncertainty	$U_{c,rel} / \%$	37.0	36.6

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with o-xylene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $61.2 \mu\text{g m}^{-3}$)	u_{span}	0.64	0.64
Lack of fit (at $20.1 \mu\text{g m}^{-3}$ and at $20.1 \mu\text{g m}^{-3}$)	u_{fit}	0.158	0.126
Repeatability standard deviation (at $6.78 \mu\text{g m}^{-3}$)	u_r	0.15	0.04
Interference from ozone (at $49.4 \mu\text{g m}^{-3}$)	u_{O_3}	0.56	1.05
Interference from other organic compounds (at $62.37 \mu\text{g m}^{-3}$)	u_{org}	2.73	1.78
Relative humidity tested at 20% RH and 80% RH (at $57.98 \mu\text{g m}^{-3}$)	u_{rh}	0.15	0.14
Surrounding temperature (at $60.26 \mu\text{g m}^{-3}$)	u_{st}	0.77	0.37
Dependence on sampling pressure (at $6.74 \mu\text{g m}^{-3}$)	u_p	0.39	0.34
Dependence on voltage ($59.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.11	0.15
Short-term drift (at $59.9 \mu\text{g m}^{-3}$)	u_s	0.28	0.35
Combined uncertainty	$(u_c/c) \%$	7.90	6.4
Expanded uncertainty	$U_{c,rel} \%$	15.8	12.8

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with o-xylene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $53.01 \mu\text{g m}^{-3}$)	u_{span}	0.53	0.53
Lack of fit (at $20.1 \mu\text{g m}^{-3}$ and at $20.1 \mu\text{g m}^{-3}$)	u_{fit}	0.158	0.126
Reproducibility standard deviation (at $6.80 \mu\text{g m}^{-3}$)	u_{rf}	0.42	0.42
Interference from ozone (at $49.4 \mu\text{g m}^{-3}$)	u_{O_3}	0.56	1.05
Interference from other organic compounds (at $62.37 \mu\text{g m}^{-3}$)	u_{org}	2.73	1.78
Relative humidity tested at 20% RH and 80% RH (at $57.98 \mu\text{g m}^{-3}$)	u_{rh}	0.15	0.14
Surrounding temperature (at $60.26 \mu\text{g m}^{-3}$)	u_{st}	0.77	0.37
Dependence on sampling pressure (at $6.74 \mu\text{g m}^{-3}$)	u_p	0.39	0.34
Dependence on voltage ($59.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.11	0.15
long-term drift (at $53.0 \mu\text{g m}^{-3}$)	u_s	0.36	0.10
Combined uncertainty	$(u_c/c) \%$	9.8	8.8
Expanded uncertainty	$U_{c,rel} \%$	19.6	17.7

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 1,3,5-trimethylbenzene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $69.2 \mu\text{g m}^{-3}$)	u_{span}	0.72	0.72
Lack of fit (at $36.0 \mu\text{g m}^{-3}$ and $36.0 \mu\text{g m}^{-3}$)	u_{fit}	0.158	0.126
Repeatability standard deviation (at $6.78 \mu\text{g m}^{-3}$)	u_r	0.15	0.08
Interference from ozone (at $53.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.37	0.076
Interference from other organic compounds (at $72.01 \mu\text{g m}^{-3}$)	u_{org}	1.80	1.65
Relative humidity tested at 20% RH and 80% RH (at $62.49 \mu\text{g m}^{-3}$)	u_{rh}	0.28	0.28
Surrounding temperature (at $65.00 \mu\text{g m}^{-3}$)	u_{st}	0.29	0.02
Dependence on sampling pressure (at $7.27 \mu\text{g m}^{-3}$)	u_p	0.40	0.37
Dependence on voltage ($64.3 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.26	0.0067
Short-term drift (at $64.6 \mu\text{g m}^{-3}$)	u_s	0.27	0.36
Combined uncertainty	$(u_c/c) \%$	6.6	5.9
Expanded uncertainty	$U_{c,rel} \%$	13.3	11.7

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 1,3,5-trimethylbenzene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $61.16 \mu\text{g m}^{-3}$)	u_{span}	0.61	0.61
Lack of fit (at $36.0 \mu\text{g m}^{-3}$ and $36.0 \mu\text{g m}^{-3}$)	u_{fit}	0.158	0.126
Reproducibility standard deviation (at $7.70 \mu\text{g m}^{-3}$)	u_{rf}	0.59	0.59
Interference from ozone (at $53.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.37	0.076
Interference from other organic compounds (at $72.01 \mu\text{g m}^{-3}$)	u_{org}	1.80	1.65
Relative humidity tested at 20% RH and 80% RH (at $62.49 \mu\text{g m}^{-3}$)	u_{rh}	0.28	0.28
Surrounding temperature (at $65.00 \mu\text{g m}^{-3}$)	u_{st}	0.29	0.02
Dependence on sampling pressure (at $7.27 \mu\text{g m}^{-3}$)	u_p	0.40	0.37
Dependence on voltage ($64.3 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.26	0.0067
long-term drift (at $61.2 \mu\text{g m}^{-3}$)	u_s	0.41	0.13
Combined uncertainty	$(u_c/c) \%$	9.9	9.6
Expanded uncertainty	$U_{c,rel} \%$	19.8	19.1

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 1,2,4-trimethylbenzene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $69.2 \mu\text{g m}^{-3}$)	u_{span}	0.72	0.72
Lack of fit (at $36.2 \mu\text{g m}^{-3}$ and $36.2 \mu\text{g m}^{-3}$)	u_{fit}	0.100	0.073
Repeatability standard deviation (at $7.67 \mu\text{g m}^{-3}$)	u_r	0.11	0.10
Interference from ozone (at $53.5 \mu\text{g m}^{-3}$)	u_{O_3}	0.40	0.098
Interference from other organic compounds (at $70.60 \mu\text{g m}^{-3}$)	u_{org}	1.47	1.41
Relative humidity tested at 20% RH and 80% RH (at $62.75 \mu\text{g m}^{-3}$)	u_{rh}	0.26	0.26
Surrounding temperature (at $65.20 \mu\text{g m}^{-3}$)	u_{st}	0.28	0.04
Dependence on sampling pressure (at $7.29 \mu\text{g m}^{-3}$)	u_p	0.42	0.56
Dependence on voltage ($64.6 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.39	0.11
Short-term drift (at $64.8 \mu\text{g m}^{-3}$)	u_s	0.30	0.33
Combined uncertainty	$(u_c/c) \%$	6.5	8.1
Expanded uncertainty	$U_{c,rel} \%$	13.0	16.3

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 1,2,4-trimethylbenzene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $59.97 \mu\text{g m}^{-3}$)	u_{span}	0.60	0.60
Lack of fit (at $36.2 \mu\text{g m}^{-3}$ and $36.2 \mu\text{g m}^{-3}$)	u_{fit}	0.100	0.073
Reproducibility standard deviation (at $7.70 \mu\text{g m}^{-3}$)	u_{rf}	2.54	2.54
Interference from ozone (at $53.5 \mu\text{g m}^{-3}$)	u_{O_3}	0.40	0.098
Interference from other organic compounds (at $70.60 \mu\text{g m}^{-3}$)	u_{org}	1.47	1.41
Relative humidity tested at 20% RH and 80% RH (at $62.75 \mu\text{g m}^{-3}$)	u_{rh}	0.26	0.26
Surrounding temperature (at $65.20 \mu\text{g m}^{-3}$)	u_{st}	0.28	0.04
Dependence on sampling pressure (at $7.29 \mu\text{g m}^{-3}$)	u_p	0.42	0.56
Dependence on voltage ($64.6 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.39	0.11
long-term drift (at $60.0 \mu\text{g m}^{-3}$)	u_s	0.43	0.13
Combined uncertainty	$(u_c/c) / \%$	6.5	8.1
Expanded uncertainty	$U_{c,rel} / \%$	13.0	16.2

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 1,2,3-trimethylbenzene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $69.2 \mu\text{g m}^{-3}$)	u_{span}	0.72	0.72
Lack of fit (at $35.3 \mu\text{g m}^{-3}$ and $35.3 \mu\text{g m}^{-3}$)	u_{fit}	0.111	0.077
Repeatability standard deviation (at $7.31 \mu\text{g m}^{-3}$)	u_r	0.16	0.06
Interference from ozone (at $52.1 \mu\text{g m}^{-3}$)	u_{O_3}	0.29	0.086
Interference from other organic compounds (at $67.28 \mu\text{g m}^{-3}$)	u_{org}	1.22	1.21
Relative humidity tested at 20% RH and 80% RH (at $61.19 \mu\text{g m}^{-3}$)	u_{rh}	0.16	0.16
Surrounding temperature (at $63.53 \mu\text{g m}^{-3}$)	u_{st}	0.11	0.11
Dependence on sampling pressure (at $7.10 \mu\text{g m}^{-3}$)	u_p	0.16	0.14
Dependence on voltage ($62.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.45	0.15
Short-term drift (at $63.2 \mu\text{g m}^{-3}$)	u_s	0.34	0.29
Combined uncertainty	$(u_c/c) / \%$	3.9	3.1
Expanded uncertainty	$U_{c,rel} / \%$	7.9	6.1

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with 1,2,3-trimethylbenzene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $57.17 \mu\text{g m}^{-3}$)	u_{span}	0.57	0.57
Lack of fit (at $35.3 \mu\text{g m}^{-3}$ and $35.3 \mu\text{g m}^{-3}$)	u_{fit}	0.111	0.077
Reproducibility standard deviation (at $7.70 \mu\text{g m}^{-3}$)	u_{rf}	2.89	2.89
Interference from ozone (at $52.1 \mu\text{g m}^{-3}$)	u_{O_3}	0.29	0.086
Interference from other organic compounds (at $67.28 \mu\text{g m}^{-3}$)	u_{org}	1.22	1.21
Relative humidity tested at 20% RH and 80% RH (at $61.19 \mu\text{g m}^{-3}$)	u_{rh}	0.16	0.16
Surrounding temperature (at $63.53 \mu\text{g m}^{-3}$)	u_{st}	0.11	0.11
Dependence on sampling pressure (at $7.10 \mu\text{g m}^{-3}$)	u_p	0.16	0.14
Dependence on voltage ($62.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.45	0.15
long-term drift (at $57.2 \mu\text{g m}^{-3}$)	u_s	0.42	0.14
Combined uncertainty	$(u_c/c) \%$	37.7	37.6
Expanded uncertainty	$U_{c,rel} \%$	75.4	75.3

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with benzene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $45.0 \mu\text{g m}^{-3}$)	u_{span}	0.47	0.47
Lack of fit (at $15.0 \mu\text{g m}^{-3}$ and $15.0 \mu\text{g m}^{-3}$)	u_{fit}	0.133	0.128
Repeatability standard deviation (at $4.98 \mu\text{g m}^{-3}$)	u_r	0.08	0.03
Interference from ozone (at $36.7 \mu\text{g m}^{-3}$)	u_{O_3}	0.33	0.37
Interference from other organic compounds (at $45.86 \mu\text{g m}^{-3}$)	u_{org}	2.38	1.29
Relative humidity tested at 20% RH and 80% RH (at $43.16 \mu\text{g m}^{-3}$)	u_{rh}	0.34	0.50
Surrounding temperature (at $44.80 \mu\text{g m}^{-3}$)	u_{st}	0.38	0.24
Dependence on sampling pressure (at $5.01 \mu\text{g m}^{-3}$)	u_p	0.39	0.23
Dependence on voltage ($44.4 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.27	0.23
Short-term drift (at $44.6 \mu\text{g m}^{-3}$)	u_s	0.13	0.10
Combined uncertainty	$(u_c/c) \%$	9.7	5.8
Expanded uncertainty	$U_{c,rel} \%$	19.5	11.7

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with benzene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $38.97 \mu\text{g m}^{-3}$)	u_{span}	0.39	0.39
Lack of fit (at $15.0 \mu\text{g m}^{-3}$ and $15.0 \mu\text{g m}^{-3}$)	u_{fit}	0.133	0.128
Reproducibility standard deviation (at $5.0 \mu\text{g m}^{-3}$)	u_{rf}	0.08	0.08
Interference from ozone (at $36.7 \mu\text{g m}^{-3}$)	u_{O_3}	0.33	0.37
Interference from other organic compounds (at $45.86 \mu\text{g m}^{-3}$)	u_{org}	2.38	1.29
Relative humidity tested at 20% RH and 80% RH (at $43.16 \mu\text{g m}^{-3}$)	u_{rh}	0.34	0.50
Surrounding temperature (at $44.80 \mu\text{g m}^{-3}$)	u_{st}	0.38	0.24
Dependence on sampling pressure (at $5.01 \mu\text{g m}^{-3}$)	u_p	0.39	0.23
Dependence on voltage $44.4 \mu\text{g m}^{-3}$ (Test made at 220 V and 240V)	u_v	0.27	0.23
long-term drift (at $39.0 \mu\text{g m}^{-3}$)	u_s	0.46	0.22
Combined uncertainty	$(u_c/c) \%$	9.8	6.0
Expanded uncertainty	$U_{c,rel} \%$	19.6	12.1

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with toluene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $53.1 \mu\text{g m}^{-3}$)	u_{span}	0.55	0.55
Lack of fit (at $29.0 \mu\text{g m}^{-3}$ and $5.72 \mu\text{g m}^{-3}$)	u_{fit}	0.130	0.078
Repeatability standard deviation (at $5.81 \mu\text{g m}^{-3}$)	u_r	0.11	0.04
Interference from ozone (at $36.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.27	0.29
Interference from other organic compounds (at $53.42 \mu\text{g m}^{-3}$)	u_{org}	2.37	1.97
Relative humidity tested at 20% RH and 80% RH (at $50.31 \mu\text{g m}^{-3}$)	u_{rh}	0.42	0.46
Surrounding temperature (at $44.27 \mu\text{g m}^{-3}$)	u_{st}	0.37	0.25
Dependence on sampling pressure (at $5.84 \mu\text{g m}^{-3}$)	u_p	0.15	0.01
Dependence on voltage ($43.8 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.23	0.17
Short-term drift (at $52.0 \mu\text{g m}^{-3}$)	u_s	0.30	0.38
Combined uncertainty	$(u_c/c) / \%$	5.8	4.4
Expanded uncertainty	$U_{crel} / \%$	11.6	8.8

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with toluene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $45.40 \mu\text{g m}^{-3}$)	u_{span}	0.45	0.45
Lack of fit (at $29.0 \mu\text{g m}^{-3}$ and $5.72 \mu\text{g m}^{-3}$)	u_{fit}	0.130	0.078
Reproducibility standard deviation (at $5.90 \mu\text{g m}^{-3}$)	u_{rf}	0.19	0.19
Interference from ozone (at $36.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.27	0.29
Interference from other organic compounds (at $53.42 \mu\text{g m}^{-3}$)	u_{org}	2.37	1.97
Relative humidity tested at 20% RH and 80% RH (at $50.31 \mu\text{g m}^{-3}$)	u_{rh}	0.42	0.46
Surrounding temperature (at $44.27 \mu\text{g m}^{-3}$)	u_{st}	0.37	0.25
Dependence on sampling pressure (at $5.84 \mu\text{g m}^{-3}$)	u_p	0.15	0.01
Dependence on voltage ($43.8 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.23	0.17
long-term drift (at $45.4 \mu\text{g m}^{-3}$)	u_s	0.42	0.26
Combined uncertainty	$(u_c/c) \%$	6.4	5.4
Expanded uncertainty	$U_{c,rel} \%$	12.8	10.8

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with ethyl benzene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $61.2 \mu\text{g m}^{-3}$)	u_{span}	0.64	0.64
Lack of fit (at $44.0 \mu\text{g m}^{-3}$ and $6.69 \mu\text{g m}^{-3}$)	u_{fit}	0.186	0.133
Repeatability standard deviation (at $6.78 \mu\text{g m}^{-3}$)	u_r	0.12	0.06
Interference from ozone (at $36.8 \mu\text{g m}^{-3}$)	u_{O_3}	0.72	0.20
Interference from other organic compounds (at $62.40 \mu\text{g m}^{-3}$)	u_{org}	1.86	1.57
Relative humidity tested at 20% RH and 80% RH (at $58.90 \mu\text{g m}^{-3}$)	u_{rh}	0.41	0.42
Surrounding temperature (at $44.92 \mu\text{g m}^{-3}$)	u_{st}	0.26	0.21
Dependence on sampling pressure (at $6.83 \mu\text{g m}^{-3}$)	u_p	0.36	0.27
Dependence on voltage ($44.5 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.21	0.16
Short-term drift (at $60.9 \mu\text{g m}^{-3}$)	u_s	0.68	0.65
Combined uncertainty	$(u_c/c) / \%$	6.9	5.5
Expanded uncertainty	$U_{c,rel} / \%$	13.7	11.0

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with ethyl benzene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $53.01 \mu\text{g m}^{-3}$)	u_{span}	0.53	0.53
Lack of fit (at $44.0 \mu\text{g m}^{-3}$ and $6.69 \mu\text{g m}^{-3}$)	u_{fit}	0.186	0.133
Reproducibility standard deviation (at $6.80 \mu\text{g m}^{-3}$)	u_{rf}	0.38	0.38
Interference from ozone (at $36.8 \mu\text{g m}^{-3}$)	u_{O_3}	0.72	0.20
Interference from other organic compounds (at $62.40 \mu\text{g m}^{-3}$)	u_{org}	1.86	1.57
Relative humidity tested at 20% RH and 80% RH (at $58.90 \mu\text{g m}^{-3}$)	u_{rh}	0.41	0.42
Surrounding temperature (at $44.92 \mu\text{g m}^{-3}$)	u_{st}	0.26	0.21
Dependence on sampling pressure (at $6.83 \mu\text{g m}^{-3}$)	u_p	0.36	0.27
Dependence on voltage ($44.5 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.21	0.16
long-term drift (at $53.0 \mu\text{g m}^{-3}$)	u_s	0.51	0.28
Combined uncertainty	$(u_c/c) \%$	8.7	7.7
Expanded uncertainty	$U_{c,rel} \%$	17.3	15.4

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with m- and p-xylene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $122.4 \mu\text{g m}^{-3}$)	u_{span}	1.27	1.27
Lack of fit (at $67.6 \mu\text{g m}^{-3}$ and $67.6 \mu\text{g m}^{-3}$)	u_{fit}	0.37	0.38
Repeatability standard deviation (at $13.5 \mu\text{g m}^{-3}$)	u_r	0.27	0.14
Interference from ozone (at $73.5 \mu\text{g m}^{-3}$)	u_{O_3}	0.56	0.39
Interference from other organic compounds (at $124.31 \mu\text{g m}^{-3}$)	u_{org}	3.09	2.58
Relative humidity tested at 20% RH and 80% RH (at $117.33 \mu\text{g m}^{-3}$)	u_{rh}	0.75	0.86
Surrounding temperature (at $89.63 \mu\text{g m}^{-3}$)	u_{st}	0.83	0.44
Dependence on sampling pressure (at $13.62 \mu\text{g m}^{-3}$)	u_p	0.57	0.39
Dependence on voltage ($88.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.38	0.25
Short-term drift (at $121.2 \mu\text{g m}^{-3}$)	u_s	1.42	1.31
Combined uncertainty	$(u_c/c) / \%$	5.7	4.2
Expanded uncertainty	$U_{crel} / \%$	11.4	8.3

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with m- and p-xylene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $105.6 \mu\text{g m}^{-3}$)	u_{span}	1.06	1.06
Lack of fit (at $67.6 \mu\text{g m}^{-3}$ and $67.6 \mu\text{g m}^{-3}$)	u_{fit}	0.37	0.38
Reproducibility standard deviation (at $13.60 \mu\text{g m}^{-3}$)	u_{rf}	0.22	0.22
Interference from ozone (at $73.5 \mu\text{g m}^{-3}$)	u_{O_3}	0.56	0.39
Interference from other organic compounds (at $124.31 \mu\text{g m}^{-3}$)	u_{org}	3.09	2.58
Relative humidity tested at 20% RH and 80% RH (at $117.33 \mu\text{g m}^{-3}$)	u_{rh}	0.75	0.86
Surrounding temperature (at $89.63 \mu\text{g m}^{-3}$)	u_{st}	0.83	0.44
Dependence on sampling pressure (at $13.62 \mu\text{g m}^{-3}$)	u_p	0.57	0.39
Dependence on voltage ($88.7 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.38	0.25
long-term drift (at $105.6 \mu\text{g m}^{-3}$)	u_s	0.71	0.33
Combined uncertainty	$(u_c/c) \%$	5.5	4.2
Expanded uncertainty	$U_{c,rel} \%$	11.0	8.4

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with o-xylene concentration indicated in bracket. From laboratory test data only	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $61.2 \mu\text{g m}^{-3}$)	u_{span}	0.64	0.64
Lack of fit (at $46.8 \mu\text{g m}^{-3}$ and $20.1 \mu\text{g m}^{-3}$)	u_{fit}	0.196	0.343
Repeatability standard deviation (at $6.78 \mu\text{g m}^{-3}$)	u_r	0.11	0.07
Interference from ozone (at $36.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.19	0.25
Interference from other organic compounds (at $62.37 \mu\text{g m}^{-3}$)	u_{org}	1.75	1.55
Relative humidity tested at 20% RH and 80% RH (at $57.98 \mu\text{g m}^{-3}$)	u_{rh}	0.39	0.27
Surrounding temperature (at $44.33 \mu\text{g m}^{-3}$)	u_{st}	0.50	0.35
Dependence on sampling pressure (at $6.74 \mu\text{g m}^{-3}$)	u_p	0.26	0.15
Dependence on voltage ($43.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.23	0.21
Short-term drift (at $59.9 \mu\text{g m}^{-3}$)	u_s	0.77	0.57
Combined uncertainty	$(u_c/c) \%$	5.5	4.3
Expanded uncertainty	$U_{c,rel} \%$	11.1	8.6

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Performance Characteristic, with o-xylene concentration indicated in bracket. From field test and laboratory test data.	Symbol	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309) / $\mu\text{g m}^{-3}$	Value of standard uncertainty component for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509) / $\mu\text{g m}^{-3}$
Uncertainty of the calibration gas (with a concentration value of $53.01 \mu\text{g m}^{-3}$)	u_{span}	0.53	0.53
Lack of fit (at $46.8 \mu\text{g m}^{-3}$ and $20.1 \mu\text{g m}^{-3}$)	u_{fit}	0.196	0.343
Reproducibility standard deviation (at $6.80 \mu\text{g m}^{-3}$)	u_{rf}	0.14	0.14
Interference from ozone (at $36.3 \mu\text{g m}^{-3}$)	u_{O_3}	0.19	0.25
Interference from other organic compounds (at $62.37 \mu\text{g m}^{-3}$)	u_{org}	1.75	1.55
Relative humidity tested at 20% RH and 80% RH (at $57.98 \mu\text{g m}^{-3}$)	u_{rh}	0.39	0.27
Surrounding temperature (at $44.33 \mu\text{g m}^{-3}$)	u_{st}	0.50	0.35
Dependence on sampling pressure (at $6.74 \mu\text{g m}^{-3}$)	u_p	0.26	0.15
Dependence on voltage ($43.9 \mu\text{g m}^{-3}$) (Test made at 220 V and 240V)	u_v	0.23	0.21
long-term drift (at $53.0 \mu\text{g m}^{-3}$)	u_s	0.48	0.24
Combined uncertainty	$(u_c/c) \%$	5.6	4.6
Expanded uncertainty	$U_{c,rel} \%$	11.9	9.2

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

6.6.5 Assessment

For the lab and field tests

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene

Additional performance criterion **not met** for the determinands: n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; 1,2,3-trimethylbenzene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: n-hexane; 2,2,4-trimethyl pentane; o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene

Additional performance criterion **not met** for the determinands: n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene; 1,2,3-trimethylbenzene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene.

Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

MCERTS performance criterion **met** for the determinand benzene.

Additional performance criterion **met** for the determinands: toluene; ethyl benzene; m-xylene; p-xylene; o-xylene

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

7. Tables and figures

7.1 Tables

Table 0.1 summarises the benzene laboratory results obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509).

Table 0.2 summarises the benzene field results obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509).

Table 0.3 summarises the benzene laboratory results obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

Table 0.4 summarises the benzene field results obtained for the tests carried out on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309).

Table 0.5 summarises the benzene laboratory results obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309).

Table 0.6 summarises the benzene field results obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309).

Table 0.7 summarises the benzene laboratory results obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 0.8 summarises the benzene field results obtained for the tests carried out on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 1: Summary of test results performed on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Table 2: Summary of test results performed on Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Table 3: Summary of test results performed on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309)

Table 4: Summary of test results performed on Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

Table 6: List of determinands and certification ranges, as agreed by the certification body

Table 7: List of determinands and key nominal concentrations agreed by the certification body, expressed in appropriate units

Table 8: "Response factors" employed to calculate concentrations Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), and Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 9: List of the “response factors” and “power factors” employed to calculate the concentrations for the Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), serial number 20720509

Table 10: List of the “response factors” and “power factors” employed to calculate the concentrations for the Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309)

Table 11: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 12: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 13: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 14: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 15: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 16: Repeatability test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 17: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 18: Repeatability test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene annual mean limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 19: Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 20: Detection limit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 21: Detection limit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 22: Detection limit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 23: Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 24: Short-term drift (24 hours) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 25: Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 26: Short-term drift (24 hours) test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene span concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 27: Dependence on sample pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 28: Dependence on sample pressure test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 29: Dependence on sample pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 30: Dependence on sample pressure test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the benzene limit concentration value (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 31: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Table 32: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 5 $\mu\text{g m}^{-3}$.

Table 33: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Table 34: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 $\mu\text{g m}^{-3}$.

Table 35: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Table 36: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 $\mu\text{g m}^{-3}$.

Table 37: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Table 38: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 5 $\mu\text{g m}^{-3}$.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 39: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Table 40: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 $\mu\text{g m}^{-3}$.

Table 41: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Table 42: Lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 $\mu\text{g m}^{-3}$.

Table 43: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 $\mu\text{g m}^{-3}$.

Table 44: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 5 $\mu\text{g m}^{-3}$.

Table 45: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 $\mu\text{g m}^{-3}$.

Table 46: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 $\mu\text{g m}^{-3}$.

Table 47: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 $\mu\text{g m}^{-3}$.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 48: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 µg m-3.

Table 49: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 0 µg m-3.

Table 50: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 5 µg m-3.

Table 51: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 15 µg m-3.

Table 52: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 25 µg m-3.

Table 53: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 35 µg m-3.

Table 54: Lack of fit tests for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out over the range between 0% and 90% of the maximum certification range of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene). Nominal benzene concentration of 45 µg m-3.

Table 55: Summary of lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Table 56: Summary of lack of fit test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Table 57: Summary of lack of fit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309)

Table 58: Summary of lack of fit test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 59: Carry-over (memory effect) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 60: Carry-over (memory effect) test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 61: Carry-over (memory effect) test results for Chromatotec GC 866 PID airtoxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 62: Carry-over (memory effect) test results for Chromatotec GC 866 PID airtoxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 63: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Table 64: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Table 65: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Table 66: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Table 67: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Table 68: Voltage test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Table 69: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 70: Voltage test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 220 V and 240 V

Table 71: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 72: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 73: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 74: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 75: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 76: Temperature test for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 77: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 78: Temperature test for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene) at 18°C and 24°C.

Table 79: Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 80: Cross sensitivity with ozone test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 81: Cross sensitivity with ozone test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 82: Cross sensitivity with ozone test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 83: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 84: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 85: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 86: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 87: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 88: Cross sensitivity with humidity test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 89: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 90: Cross sensitivity with humidity test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10th the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 91: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 92: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 93: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 94: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at the span concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 95: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 96: Cross sensitivity with organic compounds test results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 97: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Table 98: Cross sensitivity with organic compounds test results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509), carried out at 1/10 of the limit concentration for benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene).

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Table 99: Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 100: Long term drift results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 101: Long term drift results for Chromatotec GC 866 FID airToxic (Model A73022, serial number 20430309), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 102: Long term drift results for Chromatotec GC 866 FID airToxic (Model A73022, serial number 20720509), carried out at the span concentration of benzene (and the corresponding concentration values agreed by the certification body for determinands other than benzene)

Table 103: Maintenance interval for all four Chromatotec GCs

Table 104: Availability results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Table 105: Availability results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Table 106: Availability results for Chromatotec GC 866 PID airmoVOC (Model A21022, serial number 20430309)

Table 107: Availability results for Chromatotec GC 866 PID airmoVOC (Model A21022, serial number 20720509)

Table 108: Reproducibility standard deviation results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509)

Table 109: Reproducibility standard deviation results for Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309)

Table 110: Reproducibility standard deviation results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309)

Table 111: Reproducibility standard deviation results for Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509)

Table 112: Summary of uncertainties for each species for each of the four CAMs

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

7.2 Figures

Figure 1: Photograph of front of Chromatotec GC 866 FID airmoVOC (Model A21022)

Figure 2: Photograph of back of Chromatotec GC 866 FID airmoVOC (Model A21022)

Figure 3 Schematic diagram of sampling step

Figure 4 Schematic diagram of injection step

Figure 5 gives a pictorial representation of the sample analysis time cycle including details of the oven temperature programme, and valve activation process.

Figure 6 Schematic diagram of the sample analysis time cycle

Figure 7: Photograph of front of Chromatotec GC 866 PID airToxic (Model A73022)

Figure 8: Photograph of back of Chromatotec GC 866 PID airToxic (Model A73022)

Figure 9 Schematic diagram of sampling step

Figure 10 Schematic diagram of injection step

Figure 11 gives a pictorial representation of the sample analysis time cycle including details of the oven temperature programme, and valve activation process.

Figure 12 Schematic diagram of the sample analysis time cycle

Figure 13: Photograph showing the sample manifold employed to distribute the gases to the four CAMs.

Figure 14: Photograph showing the flow rate calibration system and one of the “Restrictor” valves employed to introduce the determinands from the NPL Standard Gas Mixtures into the sample manifold.

Figure 15: Photograph showing a close-up of a “Restrictor” valve coupled to a Standard Gas Mixture.

Figure 16: Photograph showing all four CAMs in operation, located in NPL’s environmental chamber.

Figure 17: shows all four CAMs in operation, located by NPL’s CATFAC for the cross interference test with water vapour.

Figure 18: Photograph showing the zero air generator (Compressor, airmoPURE 45 psi) located outside NPL’s environmental chamber, together with determinand gas mixtures being piped to the test manifold.

Figure 19: Automatic Urban Rural Network (AURN) monitoring site in Marylebone Road, London W1

Figure 20: Photograph showing the four CAMs sampling in the field test

Figure 21: Photograph showing the hydrogen generator employed by CAMs measuring VOCs with a flame ionisation detector.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Figure 22: Photograph showing the air generator employed by the CAMs measuring VOCs with a flame ionisation detector.

Figure 23: Photograph of nitrogen cylinder supplying gas to the CAMs employing photoionisation detectors, and for the pneumatic control of valves in all four CAMs.

Figure 24: Photograph showing the sample manifold employed in the laboratory to distribute the gases to the four CAMs under test.

Figure 25: Photograph showing the validated field sampling manifold.

Figure 26: Lack of fit test linear regression for Chromatotec FID 20730509 (N-Hexane)

Figure 27: Lack of fit test linear regression for Chromatotec FID 20730509 (Benzene)

Figure 28: Lack of fit test linear regression for Chromatotec FID 20730509 (I-Octane)

Figure 29: Lack of fit test linear regression for Chromatotec FID 20730509 (N-Heptane)

Figure 30: Lack of fit test linear regression for Chromatotec FID 20730509 (Toluene)

Figure 31: Lack of fit test linear regression for Chromatotec FID 20730509 (N-Octane)

Figure 32: Lack of fit test linear regression for Chromatotec FID 20730509 (Ethyl-Benzene)

Figure 33: Lack of fit test linear regression for Chromatotec FID 20730509 (M&P-Xylenes)

Figure 34: Lack of fit test linear regression for Chromatotec FID 20730509 (O-Xylene)

Figure 35: Lack of fit test linear regression for Chromatotec FID 20730509 (1,3,5-TMB)

Figure 36: Lack of fit test linear regression for Chromatotec FID 20730509 (1,2,4-TMB)

Figure 37: Lack of fit test linear regression for Chromatotec FID 20730509 (1,2,3-TMB)

Figure 38: Lack of fit test linear regression for Chromatotec FID 20190309 (N-Hexane)

Figure 39: Lack of fit test linear regression for Chromatotec FID 20190309 (Benzene)

Figure 40: Lack of fit test linear regression for Chromatotec FID 20190309 (I-Octane)

Figure 41: Lack of fit test linear regression for Chromatotec FID 20190309 (N-Heptane)

Figure 42: Lack of fit test linear regression for Chromatotec FID 20190309 (Toluene)

Figure 43: Lack of fit test linear regression for Chromatotec FID 20190309 (N-Octane)

Figure 44: Lack of fit test linear regression for Chromatotec FID 20190309 (Ethyl-Benzene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Figure 45: Lack of fit test linear regression for Chromatotec FID 20190309 (M&P-Xylenes)

Figure 46: Lack of fit test linear regression for Chromatotec FID 20190309 (O-Xylene)

Figure 47: Lack of fit test linear regression for Chromatotec FID 20190309 (1,3,5-TMB)

Figure 48: Lack of fit test linear regression for Chromatotec FID 20190309 (1,2,4-TMB)

Figure 49: Lack of fit test linear regression for Chromatotec FID 20190309 (1,2,3-TMB)

Figure 50: Lack of fit test linear regression for Chromatotec PID 20430309 (Benzene)

Figure 51: Lack of fit test linear regression for Chromatotec PID 20430309 (Toluene)

Figure 52: Lack of fit test linear regression for Chromatotec PID 20430309 (Ethyl-Benzene)

Figure 53: Lack of fit test linear regression for Chromatotec PID 20430309 (M&P-Xylenes)

Figure 54: Lack of fit test linear regression for Chromatotec PID 20430309 (O-Xylene)

Figure 55: Lack of fit test linear regression for Chromatotec PID 20720509 (Benzene)

Figure 56: Lack of fit test linear regression for Chromatotec PID 20720509 (Toluene)

Figure 57: Lack of fit test linear regression for Chromatotec PID 20720509 (Ethyl-Benzene)

Figure 58: Lack of fit test linear regression for Chromatotec PID 20720509 (M&P-Xylenes)

Figure 59: Lack of fit test linear regression for Chromatotec PID 20720509 (O-Xylene)

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

8. References

Reference 1: EN 14662 –3: 2005 – Ambient Air Quality-Standard method for the measurement of benzene concentrations-Part 3: Automated pumped sampling with in-situ gas chromatography.

Reference 2: “Performance Standards for Continuous Ambient Air Quality Monitoring Systems”, Version 7, December 2008.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

Appendix A Test Programme

21/04/2009



PROPOSED TEST PROGRAMME FOR MCERTS CERTIFICATION OF CAMS

(Revised V3)

a) CAMs to be tested

The Test Programme is based on the implementation of Option 1 :

Option 1

2 different types of CAMs (with 1 duplicate of each type of CAM)

1) FID airmoVOC (C6-C12) to measure **12 compounds**:

Benzene; 2,2,4-trimethyl pentane; n-heptane; toluene; n-octane; ethyl-benzene; m-xylene; p-xylene, o-xylene; 1,3,5-trimethylbenzene; 1,2,4-trimethylbenzene; 1,2,3-trimethylbenzene

2) PID airToxic to measure **6 compounds**: benzene; toluene; ethyl benzene; m-xylene; p-xylene; o-xylene.

(m-xylene and p-xylene will be analysed as one peak, and will be reported as the sum of the two determinands)

All 4 analysers will measure simultaneously from the same sample gas line. Chromatotec will advise on the sample flow requirements and any other gases required to operate the CAMs.

b) Compounds to be tested

Adoption of Option 1 indicates that 12 compounds listed in Annex X of European Directive 2008/50/EC on ambient air, including benzene will be tested. The determinands will be generated from 30 component EU Directive ozone precursor mixtures diluted in nitrogen, which are produced by NPL. The parent mixtures will be diluted as required in zero nitrogen. The starting concentration in the parent mixtures (before dilution), expressed in units of parts per billion, will be the same for all 30 compounds.

For the purposes of all the other relevant determinands the limit value for benzene shall be considered to apply (**Ref 1**). The certification range for the type approval tests is $0 \mu\text{g m}^{-3}$ to $50 \mu\text{g m}^{-3}$ (standardised to 101.3 kPa and 293 K) for benzene, which is equivalent to 15.4 parts

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

per billion (ppb). The certification range of the other determinands in the test programme will also be 15.4 ppb.

c) Test Programme

The test programme will be carried out generally in accordance with the requirements detailed in EN 14662 –3: 2005 – Ambient Air Quality-Standard method for the measurement of benzene concentrations-Part 3: Automated pumped sampling with in-situ gas chromatography, hereby defined as **Ref 1**. This is fully compatible with the requirements of MCERTS in “Performance Standards for Continuous Ambient Air Quality Monitoring Systems”, Version 6 December 2008. Additional guidance, where appropriate, is given below for some of the tests.

The autocalibration function of the relevant CAM will be active for all laboratory tests, but not active during the field tests (to assess the drift).

Where the performance criteria is required to be reported as a percentage of a concentration in $\mu\text{g m}^{-3}$ (Ref 1, Table 2) then the certification body should clarify whether the maximum range ($50 \mu\text{g m}^{-3}$) or the maximum benzene concentration for a particular test is used in the calculation. Note, that expressing the concentration in $\mu\text{g m}^{-3}$ will mean that the other 11 determinand compounds will all have different input values in these units.

The determinands m-xylene and p-xylene will be analysed from a single unresolved chromatographic peak, while o-xylene will be measured from a separate peak.

LABORATORY TESTS

The laboratory reference conditions for the tests will be $(20 \pm 2)^\circ\text{C}$, 40% to 60% relative humidity, supply voltage 230 V nominal, 50 Hz nominal.

A1. Installation and Commissioning

Arrange with manufacturer for installation, ensuring that this follows the instruction manual. Report on any deviations or extra parts required. Manufacturer should commission the instruments, and may re-calibrate the instrument using factory supplied artefacts or gas cylinders supplied by the test house. Recalibration details to be reported. **See Ref 1, clause 8.5.2.1.**

Both types of CAMs under test will employ a cycle time of 30 minutes (of which 22 minutes is for the sampling time, and 3 minutes is for the thermal desorption time).

B1. Repeatability

Carried out at the limit value and 1/10 of the limit value of benzene, namely $5 \mu\text{g m}^{-3}$ (1.54 ppb) and $0.5 \mu\text{g m}^{-3}$ (0.15 ppb). All other determinands involved in the test will have concentrations of 1.54 ppb and 0.15 ppb.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

A total of 11 successive determinand sample injections will be carried out. The first sample result will be rejected. The CAM will sample ambient air before and after the test. **See Ref 1, clause 8.5.5, and Table 2 (rows 2 and 3 < 0.3 $\mu\text{g m}^{-3}$ at 1/10th of the limit value and < 0.15 $\mu\text{g m}^{-3}$ at the limit value).**

The **detection limit**, as defined in Ref 1, clause Section 9.3.6, will be determined at 1/10 of the limit value.

If the CAM meets the repeatability performance criteria determined above by a factor of two or more, ie, < 0.15 $\mu\text{g m}^{-3}$ and 0.075 $\mu\text{g m}^{-3}$ respectively, then the number of determinand sample injections required in the lack of fit test (B4) may be reduced to five samples, The first sample will be rejected.

B2. Short term drift

Carried out at the span value (between 70% and 90% of certification range) of benzene, namely 45 $\mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test will have a concentration of 13.9 ppb.

A total of 5 determinand sample injections will be carried out. The first sample result will be rejected. The test will be repeated again after 24 hours. The CAM may sample ambient air before and after the test. **See Ref 1, clause 8.5.4, and Table 2.**

B3. Dependence on sample gas pressure

Carried out at the limit value of benzene, namely 5 $\mu\text{g m}^{-3}$ (1.54 ppb). All other determinands involved in the test will have concentrations of 1.54 ppb. A total of 5 determinand sample injections will be carried out at the limit value for each pressure. The first sample result will be rejected in each case.

The test will be carried out at a pressure of **90 kPa**, and again at **110 kPa**. The CAM may sample ambient air before and after the test. **See Ref 1, clause 8.5.6 and Table 2.**

B4. Lack of fit (Linearity)

Carried out at the following concentrations: 0, 5, 15, 25, 35, 45 $\mu\text{g m}^{-3}$, which is equivalent to 0, 1.54, 4.62, 7.70, 10.8, 13.9 ppb for benzene. All other determinands involved in the test will have a concentration of 0, 1.54, 4.62, 7.70, 10.8, 13.9 ppb. A total of 7 determinand sample injections will be required for each concentration. The first sample result will be rejected in each case.

Depending on the results of the repeatability tests the number of valid samples will be reduced to five at each concentration. The first sample result will be rejected in each case.

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

The test criterion for the zero point shall be less than 5% of the limit value, namely less than $\pm 0.25 \mu\text{g m}^{-3}$. The CAM may sample ambient air before but **not** after this test, **until B5** has been completed. **See Ref 1, clause 8.5.3 and Table 2.**

B5. Carry-over (memory effect)

This test must be carried out immediately **after B4**. 2 samples of zero gas will be injected into the CAM. The measured concentration of benzene should not exceed $1 \mu\text{g m}^{-3}$ (0.31 ppb) after the first injection and shall not exceed $0.5 \mu\text{g m}^{-3}$ (0.15 ppb) after the second injection.

All other determinands involved in the test should not exceed a concentration of 0.31 ppb after the first injection and shall not exceed 0.15 ppb after the second injection. The CAM may sample ambient air after the test is completed. **See Ref 1, clause 8.5.10 and Table 2.**

B6. Dependence on voltage

Carried out at the limit value and 1/10 of the limit value of benzene, namely $5 \mu\text{g m}^{-3}$ (1.54 ppb) and at the span value (between 70% and 90% of certification range), namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test will have concentrations of 1.54 ppb and 13.9 ppb at each voltage. A total of 5 determinand sample injections will be carried out at for each voltage. The first sample result will be rejected in each case.

The test will be carried out at a voltage of **220 V**, and **240 V**. The CAM may sample ambient air before and after the test. **See Ref 1, clause 8.5.8 and Table 2.**

B7. Dependence on surrounding air temperature

Carried out at the limit value and 1/10 of the limit value of benzene, namely $0.5 \mu\text{g m}^{-3}$ (0.15 ppb) and at the span value (between 70% and 90% of certification range), namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test will have concentrations of 0.15 ppb and 13.9 ppb at each temperature.

The CAMs will be contained in an environmental chamber, but the gas injection system will be outside the chamber. The test will be carried out with the environmental chamber at **18°C** and **24°C**. A total of 5 determinand sample injections will be carried out at each concentration at 18°C, and then again at 24°C. The first sample result will be rejected in each case.

The warm up time will be a minimum of 6 hours, or overnight if more convenient. The CAM may sample ambient air before and after the test, and also during the temperature change from 18°C to 24°C. **See Ref 1, clauses 8.5.7 and 8.5.2.1, and Table 2.**

B8. Cross interference with ozone

Carried out at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other hydrocarbon determinands involved in the test will have a concentration of 13.9 ppb.

Reference: E09040018

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Checked by: W. A. Martin

Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20730509),
 Chromatotec GC 866 FID airmoVOC (Model A21022, serial number 20190309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20430309),
 Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

A total of 5 determinand sample injections will be carried out without the presence of ozone. This will be followed by 5 sample injections with the determinand and the cross interferent ozone present simultaneously. The first sample result from each group of five will be rejected in each case.

The supplied concentration of ozone will be approximately $180 \mu\text{g m}^{-3}$ (90 ppb). A correction to the concentration of the determinand shall be made for any dilution effect due to the addition of the interferent. The CAM may sample ambient air before and after the test. **See Ref 1, clauses 8.5.9.1 and 8.5.9.2, and Table 2.**

B9. Cross interference with water (relative humidity test)

Carried out at the limit value and 1/10 of the limit value of benzene, namely $0.5 \mu\text{g m}^{-3}$ (0.15 ppb) and at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other hydrocarbon determinands involved in the test will have a concentration of 0.15 ppb and 13.9 ppb.

A total of 5 determinand sample injections will be carried out at **the lower** concentration without the presence of water vapour. This will be followed by 5 sample injections with the determinand and the cross interferent water vapour present simultaneously. The first sample result from each group of five will be rejected in each case. Samples with and without the cross interferents will be injected, and treated in a similar manner, at the **higher** concentration.

The cross interference test will be carried out at a relative humidity of 20 % and 80%. A correction to the concentration of the determinand shall be made for any dilution effect due to the addition of the interferent. The CAM may sample ambient air before and after the test. **See Ref 1, clauses 8.5.9.1 and 8.5.9.3, and Table 2.**

B10. Cross interference with organic compounds

Carried out at the limit value and 1/10 of the limit value of benzene, namely $0.5 \mu\text{g m}^{-3}$ (0.15 ppb) and at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other hydrocarbon determinands involved in the test will have a concentration of 0.15 ppb and 13.9 ppb.

The ten potential organic cross interferents are listed with their concentration range in **Ref 1, Table 4**, and are: methylcyclopentane, 2,2,3-trimethylbutane, 2,4-dimethylpentane, tetrachloromethane, cyclohexane, 2,3-dimethylpentane, 2-methylhexane, 3-ethylpentane, trichloroethylene, n-heptane. The cross interferents will be present at known concentrations of approximately $10 \mu\text{g m}^{-3}$, which corresponds to approximately 2.4 ppb for compounds with a molecular mass of 100 g mol^{-1} .

A total of 5 determinand sample injections will be carried out at **the lower** determinand concentration without the presence of organic interferents. This will be followed by 5 sample injections with the determinand and the cross interferents present simultaneously. The first

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Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

sample result from each group of five will be rejected in each case. Samples with and without the cross interferents will be injected, and treated in a similar manner, at the **higher** concentration.

A correction to the concentration of the determinand shall be made for any dilution effect due to the addition of the interferent. The CAM may sample ambient air before and after the test. **See Ref 1, clauses 8.5.9.1 and 8.5.9.4, and Table 2.**

FIELD TESTS

A site at Marylebone Road in Central London has been selected for the field tests. The tests will last 3 months. During the 3 month period, the maintenance requirements by the manufacturer of the analyser shall be followed.

In Ref 1, clause 8.6.4 states that no zero and span adjustments shall be made to the analyser as this will influence the determination of the long term drift. The measurement data from the analyser shall only be corrected numerically, by assuming linear drifts since the previous zero and span checks.

C1. Operational Requirements

The calibration/drift tests shall be carried out at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test will have a concentration of 13.9 ppb.

A total of 5 determinand sample injections will be carried out every **two** days for the **first** 14 days of the field tests. The first sample result will be rejected in each case.

The CAM will sample ambient air at all other times when span measurements are not being carried out, using the same protocol as above. **See Ref 1, clause 8.6.4.**

For the duration of the field test, no zero and span adjustments shall be made to the CAM as this will influence the determination of the long term drift. The measurement data from the CAM shall only be corrected numerically, assuming a linear drift since the last zero and span check.

For the **next five** 14 day periods a total of 5 determinand sample injections will be carried out **every** 14 days. The first sample result will be rejected. The CAM will sample ambient air at times when span measurements are not being carried out, using the same protocol as above. **See Ref 1, clause 8.6.4.**

C2. Long term drift

This makes use of the measurements obtained in **C1** every 14 days using data at the span value (between 70% and 90% of certification range) of benzene, namely $45 \mu\text{g m}^{-3}$ (13.9 ppb). All other determinands involved in the test will have a concentration of 13.9 ppb.

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Chromatotec GC 866 PID airToxic (Model A73022, serial number 20720509).

A total of 5 determinand sample injections will be employed for each measurement. The first sample result will be rejected. The CAM will sample ambient air at times when span measurements are not being carried out. There will be 5 sets of data. The largest value of the drift will comply with the requirements **detailed in Ref 1, clause 8.6.5 and Table 5.**

C3. Maintenance interval

At least 2 weeks, but could be the duration of the field test. **See Ref 1, clause 8.6.6 and Table 5. The manufacturer will advise on time period required.**

C4. Availability

Checks on the correct operation at least **every 14 days**, preferably performed daily. **See Ref 1, clause 8.6.7 and Table 5.**

C5. Reproducibility standard deviation under field conditions.

Carried out by comparing the ambient measurement data between pairs of CAMs throughout the 3 month trial. It does not include measurements of span gases or down time for maintenance. **See Ref 1, clause 8.6.8 and Table 5.**

Uncertainty calculation

The expanded uncertainty at the 95% confidence level will be estimated at the annual EU limit using the method described in **Ref 1, clauses 8.7.1, 8.7.2 and 8.7.3.** Guidance on the calculation is given in **Ref 1, Annex B.** In the case of benzene the value of the relative expanded uncertainty should not be greater than $\pm 25\%$ at the limit value.

The calculations will assume limit values identical to that for benzene for all the remaining determinand species and a statement of the value of the uncertainty will be included for information purposes.

Appendix B Operating manuals supplied by the manufacturer

CHROMATOTEC Group / airmotec	STANDARD USER MANUAL SMU 0003	Application date : 05 June 2013
		Version : N° 00

AIRMOVOC C6-C12 (BTEX INCLUDED)

WITH INTERNAL PC

Historic

Version N°	Modification nature	Application date	Modified chapters
00	Creation of a user's manual of airmoVOC C6C12 with internal and external calibration	05 June 2013	All

Editor : Sandra LANDART	Checked by : Mickael Gezat Benoit Calatayud	Approved by : Michel ROBERT
Visa :	Visa :	Visa :

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A.OBJET

User's manual for the analyser airmoVOC C₆-C₁₂: Presentation of the analyser, operating principle, installing, starting and stop of the analyser, calibration and troubleshooting.

B.APPLICATION FIELD

Analysers airmoVOC C6-C12.

C.DEFINITIONS

D.REFERENCE DOCUMENTS

Vistachrom user manual 1.47 (reference: **SMQ 0004-10 GCSV 147 UK.pdf**)

Installation and starting manual of the airmoVOC C₆-C₁₂ (reference: **SMU Installation and Starting manual of an analyser FID.pdf**)

Easy start airmoVOC C6C12 with option internal calibration (reference: **easy start airmoVOC.C6-C12 CAL.pdf**)

Easy start airmoVOC C6C12 (reference: **easy start airmoVOC C6C12.pdf**)

Easy calib airmoVOC C6C12 and airmo BTX Internal and External calibration (reference: **EASY CALIB airmoVOC.pdf**)

E. AIRMOVOC C6-C12 PRESENTATION

E.1. INTRODUCTION

The airmoVOC C₆-C₁₂ is a high performance gas chromatograph with Flame ionisation detector (FID) and an on-line sample preparation. It is designed for the analysis of VOC compounds (For example BTEX: Benzene, Toluene, ethyl-benzene, m&p-xylene and o-xylene) in gaseous samples, in ambient (100 ppt) to emission (ppm) concentration ranges. The miniaturisation, the inertia to chemical compounds, the mobility and flexibility of this analyser have been optimised.

Thanks to an integrated CPU board allowing a dialogue with a PC, this analyser is an automate.

The chromatography software allows:

- ◆ A complete automation of the system.
- ◆ The signal acquisition, and data treatment.
- ◆ Data displayed by Peak Viewer software
- ◆ The peak identification thanks to a reference substance table.
- ◆ Data saving on the hard disk.
- ◆ Trend creation allowing a visualisation of the evolution of selected peak retention times and surface (or concentration of the corresponding compounds).

This compact instrument only requires little space, power and gas. The air for FID can be generated by a compressor (air generator) and hydrogen by a hydrogen generator. Thanks to its high level of automation, it is suitable for continuous pollution monitoring. Therefore, the airmoVOC-C₆-C₁₂ is suitable for in situ operation.

E.2. GENERAL CHARACTERISTICS

Model: airmoVOC C6-C12 A21022 with integrated PC 5U

Pneumatic valve: 6 ports 1/8 " (A 6UWT), pneumatic

Replacement rotor: SSA-6-UWT

Analytical column: Capillary metallic column, id = 0.28 mm, length: 30 m, MXT30 CE, 1 µm

Detector: Flame ionisation detector (FID)

Carrier gas: Hydrogen (quality 5.6)

Trap: L = 8 cm; id = 1.5 mm

Critical orifice: 76 µm (Option: 50 µm or 100 µm)

Supply voltage: 115 VAC or 230 VAC, 24 volts option

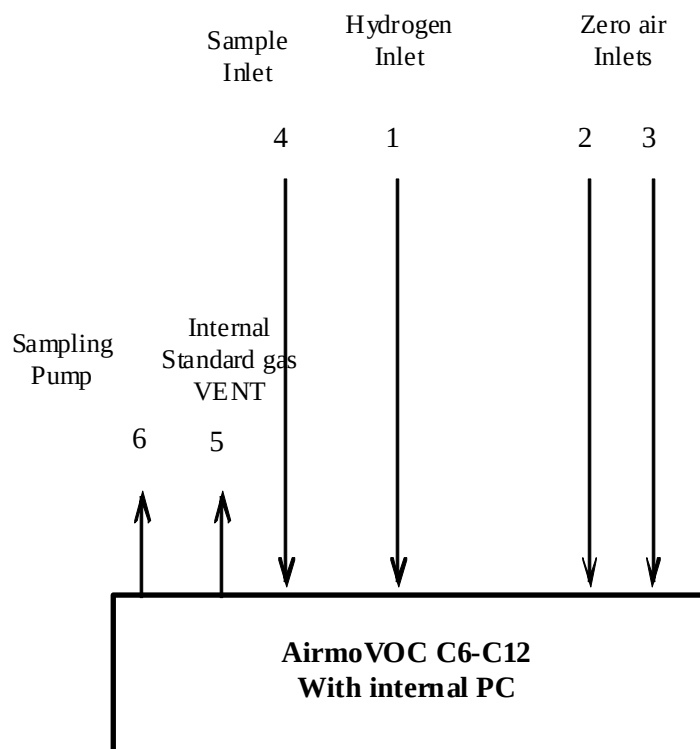
Vistachrom software

Dimension: 19", 5U

Weight: 25kg (packed: 40kg)

Option: Internal calibration

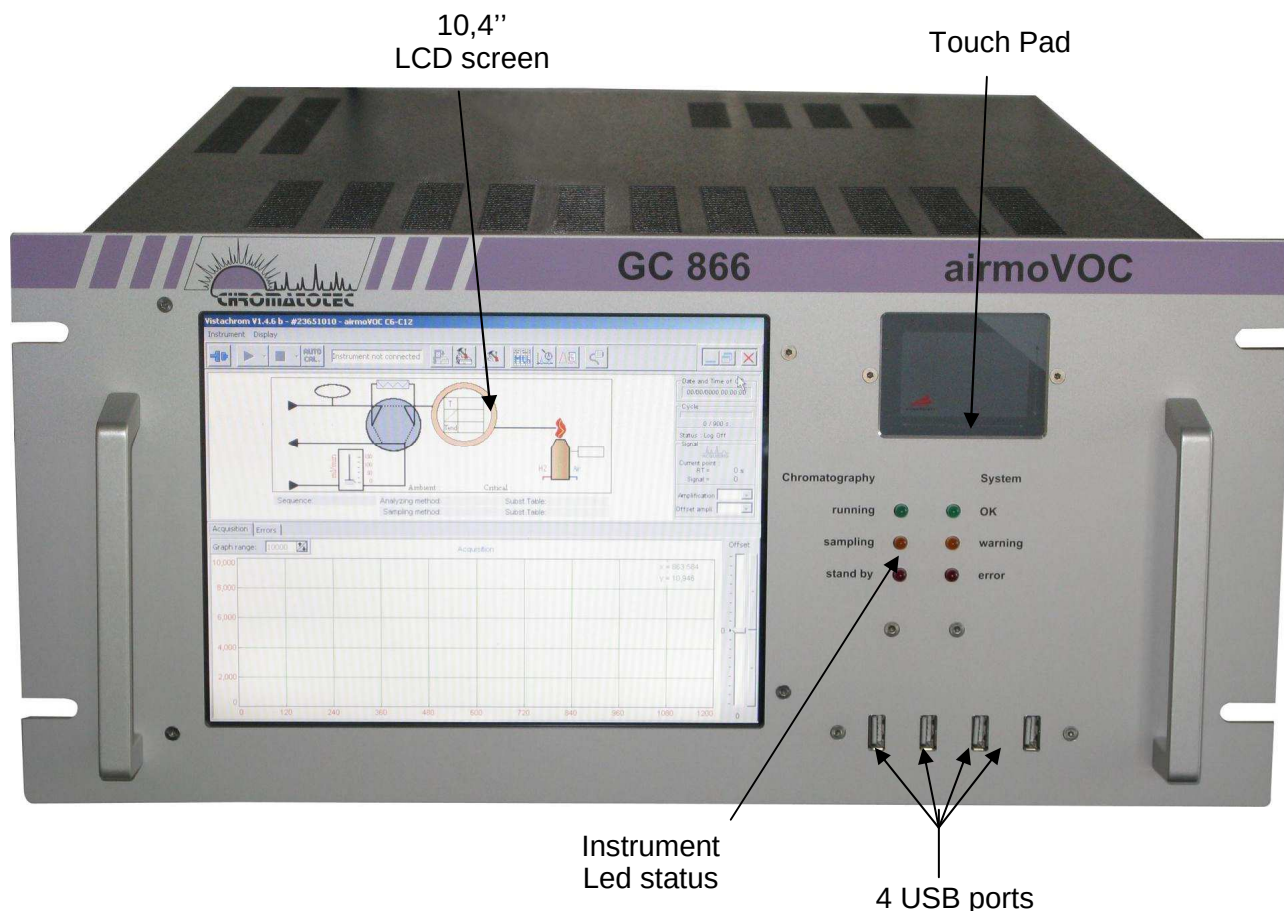
E.3. FUNCTIONAL DIAGRAM



Legend:

- 1:** Hydrogen inlet to connect a Hydroxymchrom or a cylinder for carrier gas and flame of FID- 1/16" fitting
- 2 :** Zero air inlet for the FID and the internal permeation oven – 1/8" fitting
- 3 :** Zero air inlet for the pneumatic valve commutation-1/8" fitting
- 4:** Inlet for Sample (ambient air,...)-1/4" fitting
- 5:** Permeation tube VENT. **(With Internal calibration (internal permeation oven))**
- 6:** Sampling pump- 1/4" fitting

E.4. FRONT FACE SCHEME



Size 5U :	
Length :	48,0 cm
Height :	22,0 cm
Depth :	73,0 cm

With the USB Port, you can connect a mouse and a keyboard to an easy using of the internal pc.

The front face of the analyser presents:

- 6 LEDS indicating the state of the Check. 3 concern the chromatograph, and 3 the communication with the PC.

Cycle:

"**Running**": the green LED is lit during the acquisition.

"**Sampling**": the yellow LED is lit during sampling when the sample flow is set by a critical orifice.

"**Stand by**": the red LED is lit when the system is in stand-by.

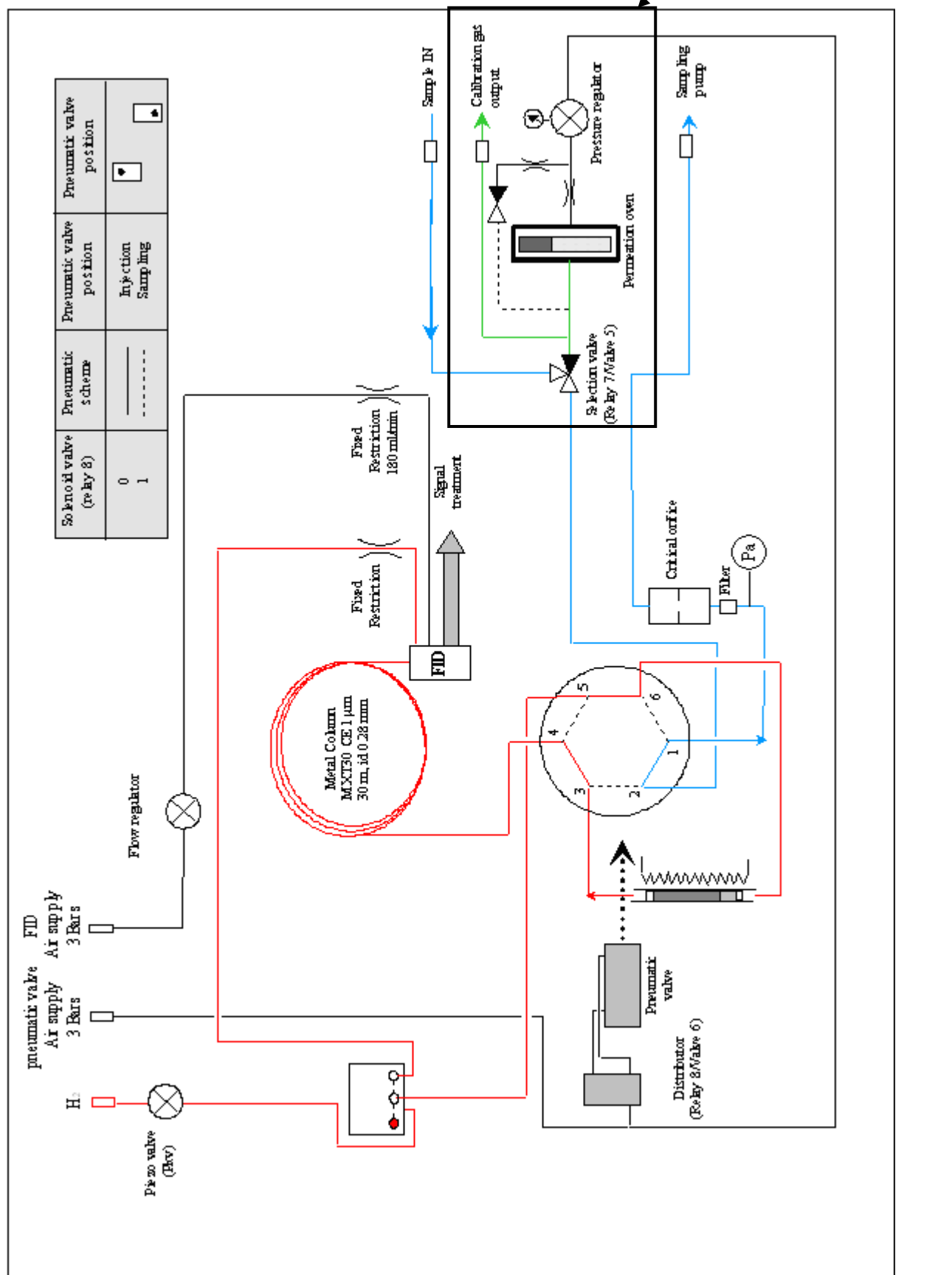
System: A2 communication protocol (when the analyser is connected to Acquisition software and when Acquisition software is in the on-line window)

"**OK**": the green LED is lit when the communication between analyser and PC is correct.

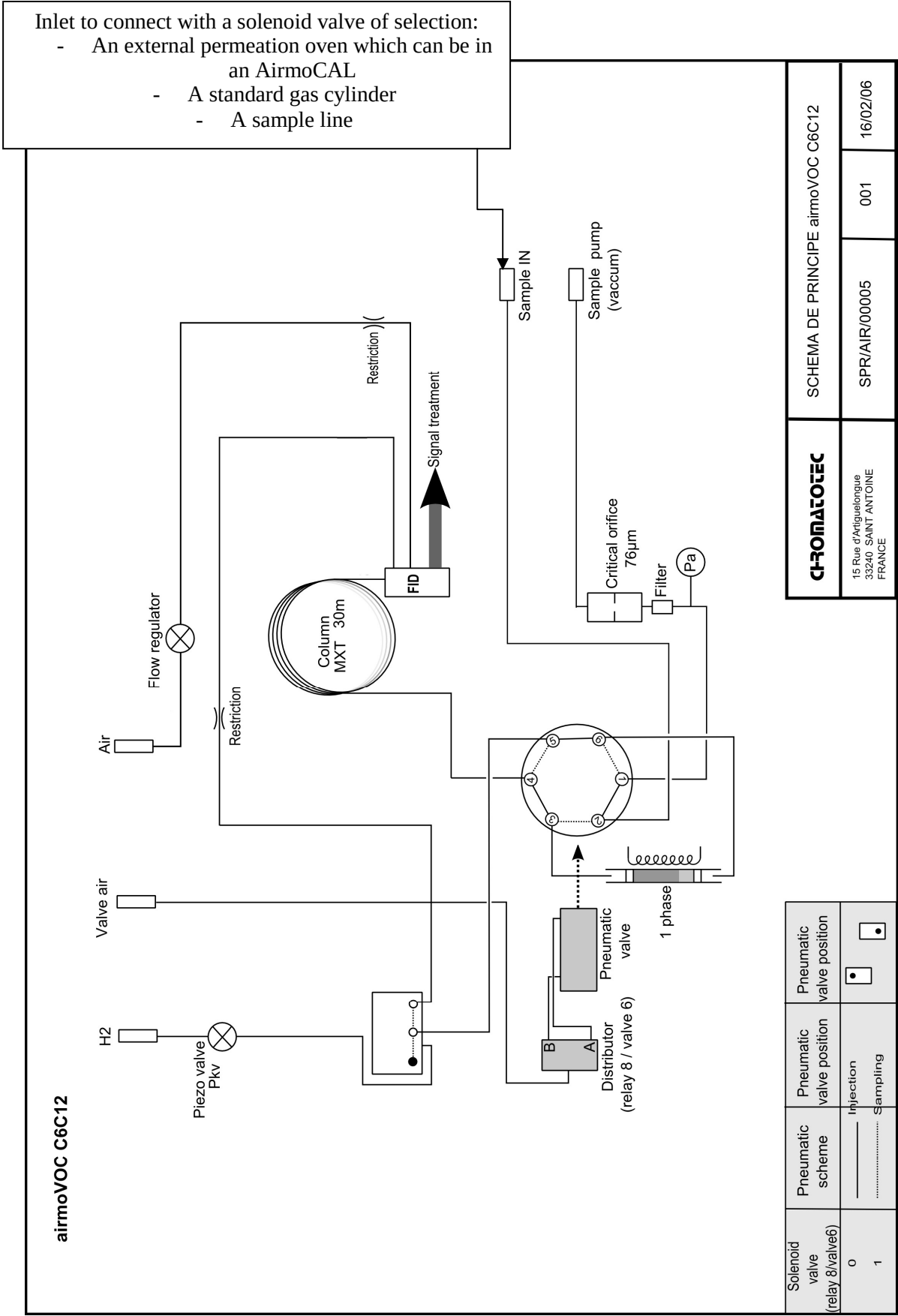
"**Warning**": the yellow LED is lit to indicate something is wrong. For example, if an acquisition is running and if the software is not on the on-line menu (the acquisition is lost) (error number 1xx).

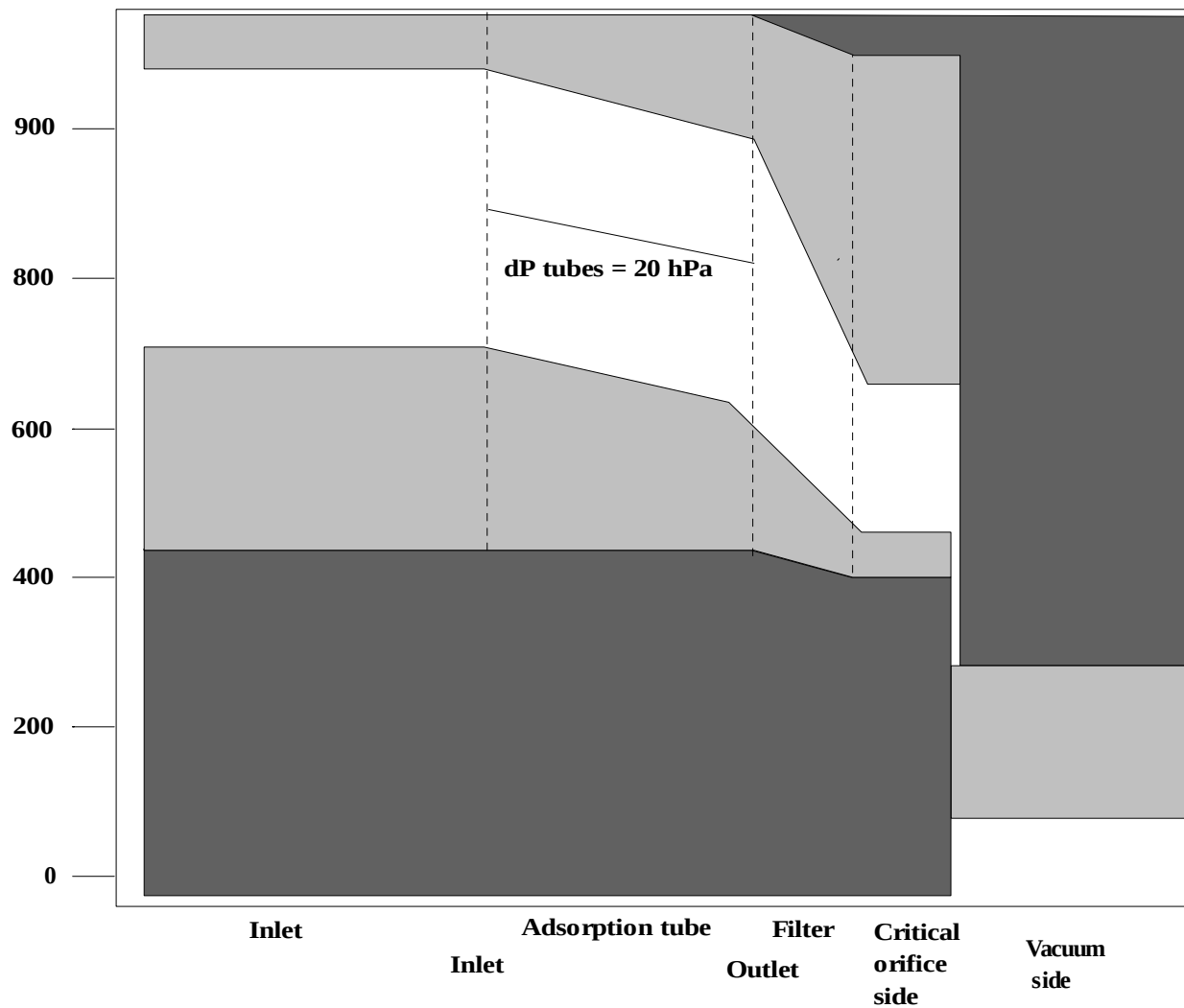
"**Error**": the red LED is lit when an important error has occurred (error number 2xx).

E.5. PNEUMATIC SCHEME OF AIRMOVOC C6C12 WITH OPTION INTERNAL CALIBRATION DEVICE

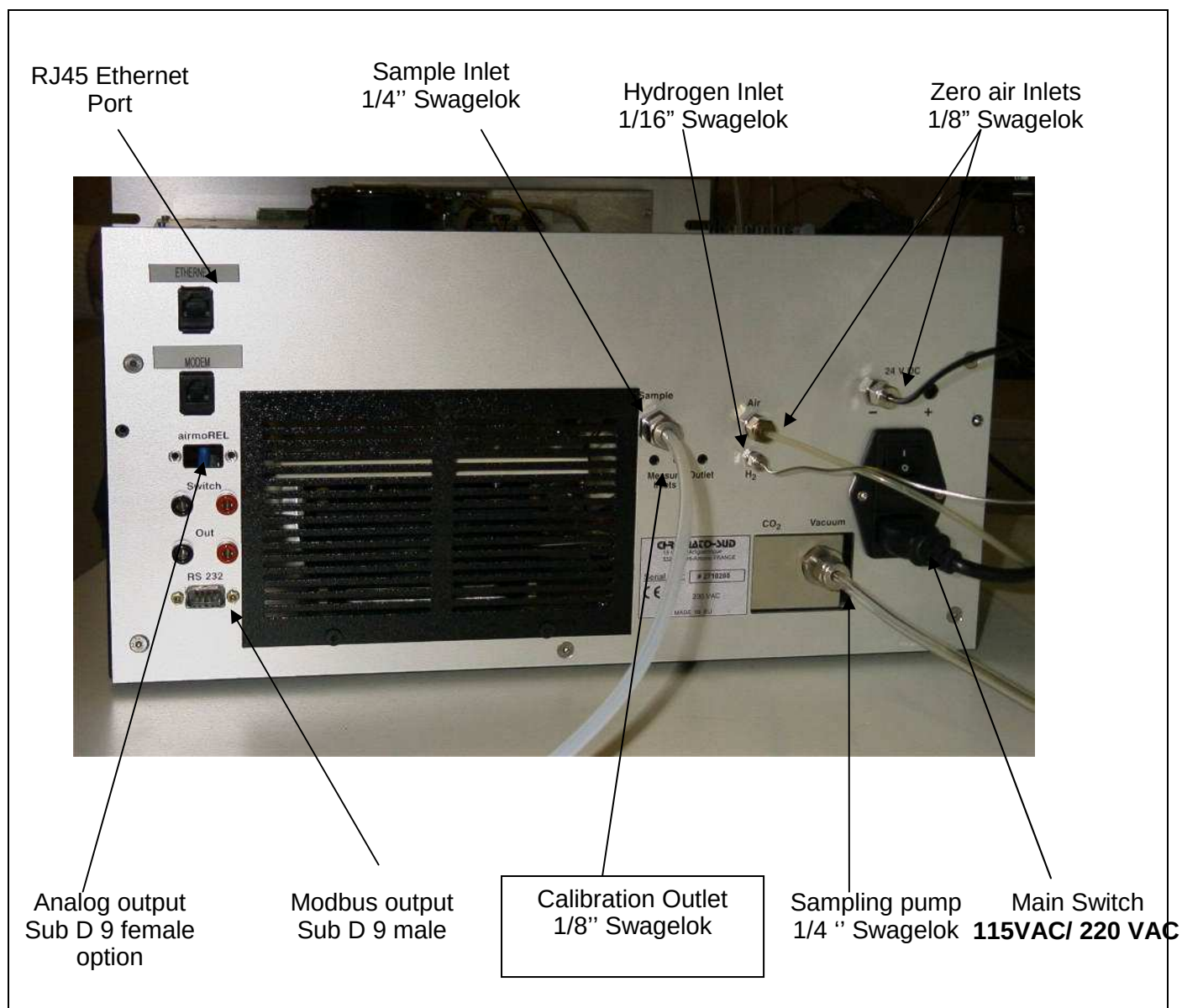


E.6. PNEUMATIC SCHEME OF AIRMOVOC C6C12



E.7. SAMPLING PUMP CHARACTERISTICS**Pressure in hPa (inlet)**

E.8. BACK FACE



Size 5U:
Length: 42,5 cm
Height: 21,0 cm

F. OPERATING PRINCIPLE OF THE AIRMOVOC C6-C12

The analysis cycle comprise 4 steps described here below.

F.1. MEASURING PRINCIPLE

F.1.1. INTRODUCTION

A complete cycle of analysis is done in two successive steps.

- The first stage is the sampling step: it consists to pre-concentrate the VOC contained in the ambient air or in the standard gas.
- The following stage is the analysis step: the trapped VOC are injected in the analytical column by thermal desorption during few minutes (depending on the cycle duration). Then the VOC are separated by the analytical column and detected by the FID.

F.1.2. SAMPLING

The gas sample is drawn by an external pump through a trap, a fine tube containing porous substances, which extracts the gas components according to their affinity with these phases. For example, permanent gases and water vapour are not retained. The trap phase is chosen so as to trap from C5 compounds to C12 compounds.

It is possible, if required, to add to the sample flow an exactly known amount of reference standard compounds.

The volume of gas sample (ambient air or gas standard from internal or external calibration) is measured downstream of the adsorption section, thanks to a critical orifice which set the flow and thanks to the sampling time.

At the end of the sampling, a relay commutes directing the sample flow to the vent. The sampling flow is fixed in the instrument by a critical orifice of 50, 76 or 100 μm . The sampling flow is about 10 to 25 ml/min, 35 to 45 ml/min or 60 to 70 ml/min.

The entrance pressure of the sample must be near atmospheric pressure so that the measurement of the volume sampled by the analyser is correct. This measurement is made thanks to the Pa board and depends on the dimension of the critical orifice. When the analyser is in phase of sampling step, the Pa board must measure the same pressure whatever the sample entering the analyser.

F.1.3. INJECTION OF THE SAMPLE IN THE ANALYTICAL COLUMN (TRAP AND DESORPTION)

The pneumatic valve that was in "sampling" position gets in "injection" position, thereby inserting the sampling tube in the carrier gas circuit in the way opposite to the sampling way. At this time, the trap is heated to desorb the compounds. The gaseous sample is introduced in the analytical column by the carrier gas flow.

F.1.4. CHROMATOGRAPHIC SEPARATION

The analytical column is situated in an oven. The temperature is programmed with a gradient that starts at 60 seconds of the cycle. The sample components elute in the column at a characteristic rate (depending of their boiling point and of their interactions with the column stationary phase). Generally, the retention time of the compounds increases with their molecular weight (boiling point).

F.1.5. DETECTION AND DATA TREATMENT

At the extremity of the column, a flame ionisation detector (FID) generates an electrical signal proportional to the concentration of the sample components as they elute from the column. This electrical signal is digitised to be transferred to the CPU board where the microprocessor processes the data (integration, mass or concentration calculation, peak identification...). All parameters (data results, chromatograms, integration reports...) are then transferred via a RS-232 output where they can be displayed and reprocessed by the software. The digitised signal is also available as an analogue output (0-1V).

The data acquisition starts 6s after the trap thermodesorption end.

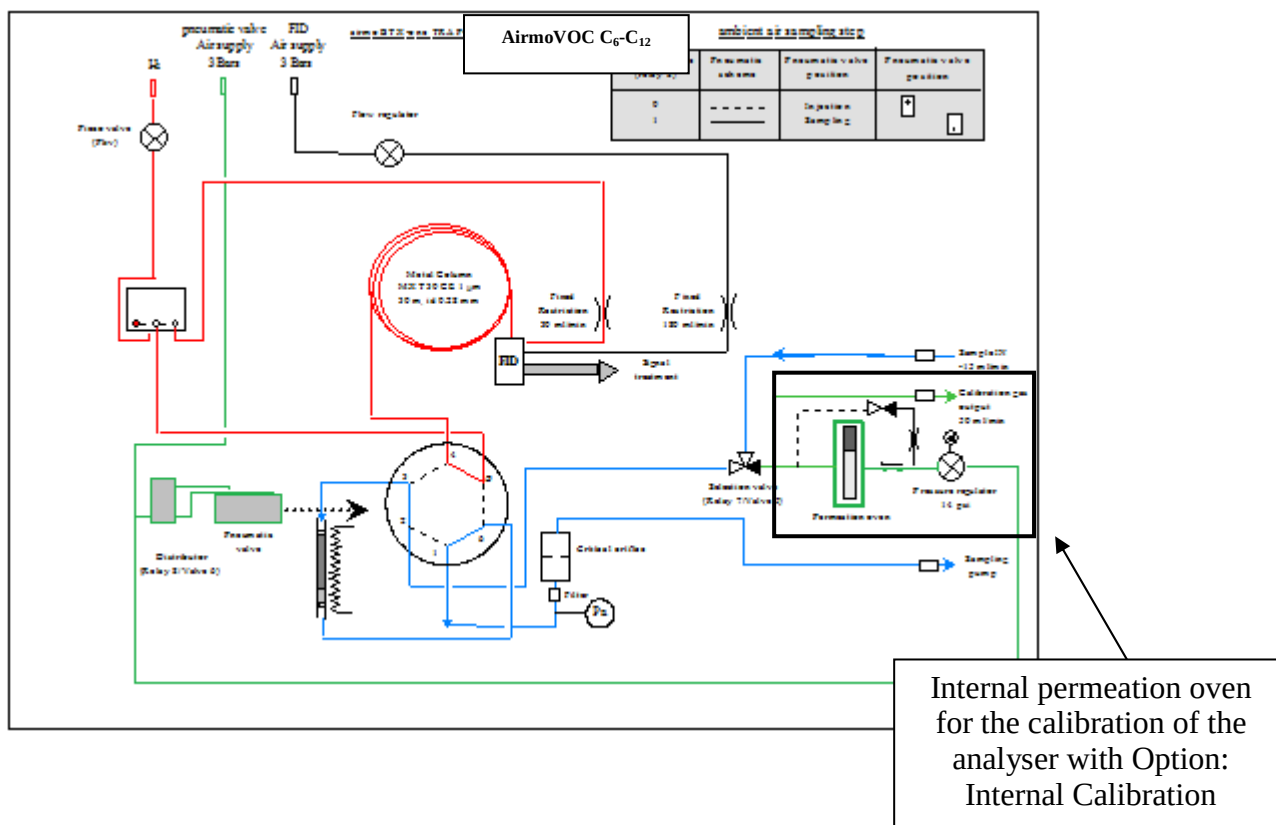
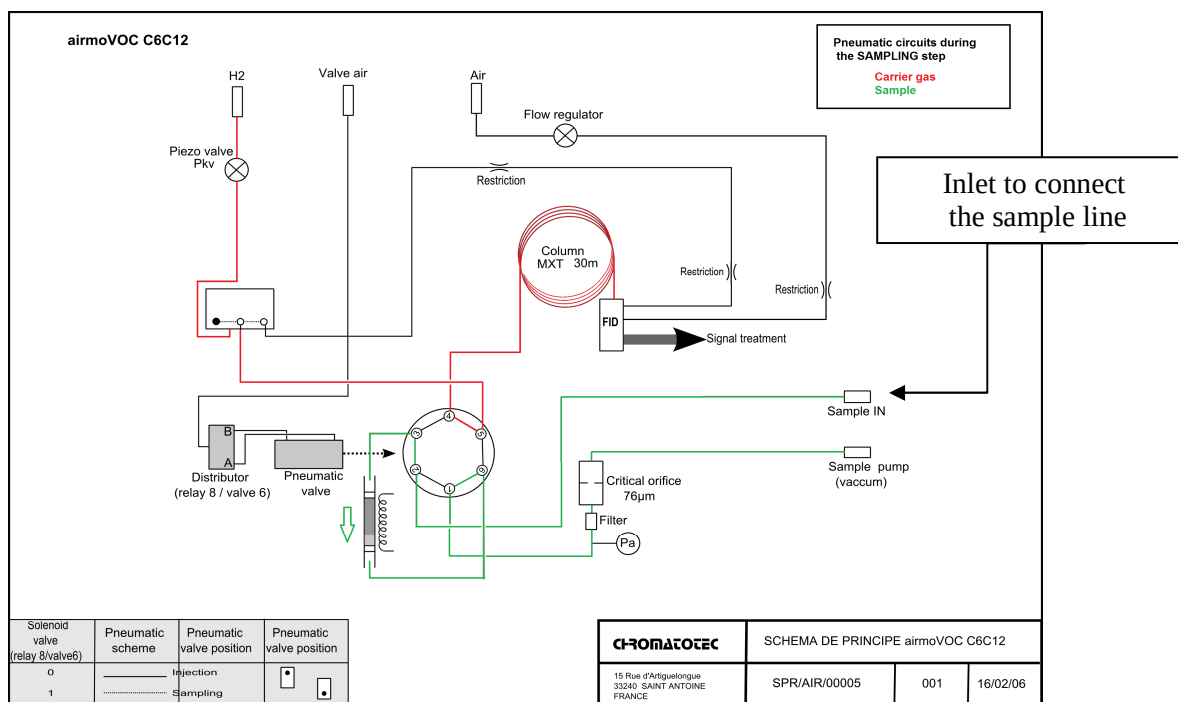
Caution: During this analysis, it is prohibited to exit the ON-LINE menu because the data would be lost. But, it is possible to reduce the software window.

The complete cycle (sampling of the compounds by trapping, injection, chromatographic analysis, and detection) is repeated. The on-board microprocessor stores the data, calculates the selected compound concentrations and stores them. The compounds identification is made on the basis of their retention times, and concentrations are calculated in reference to standard compound analyses.

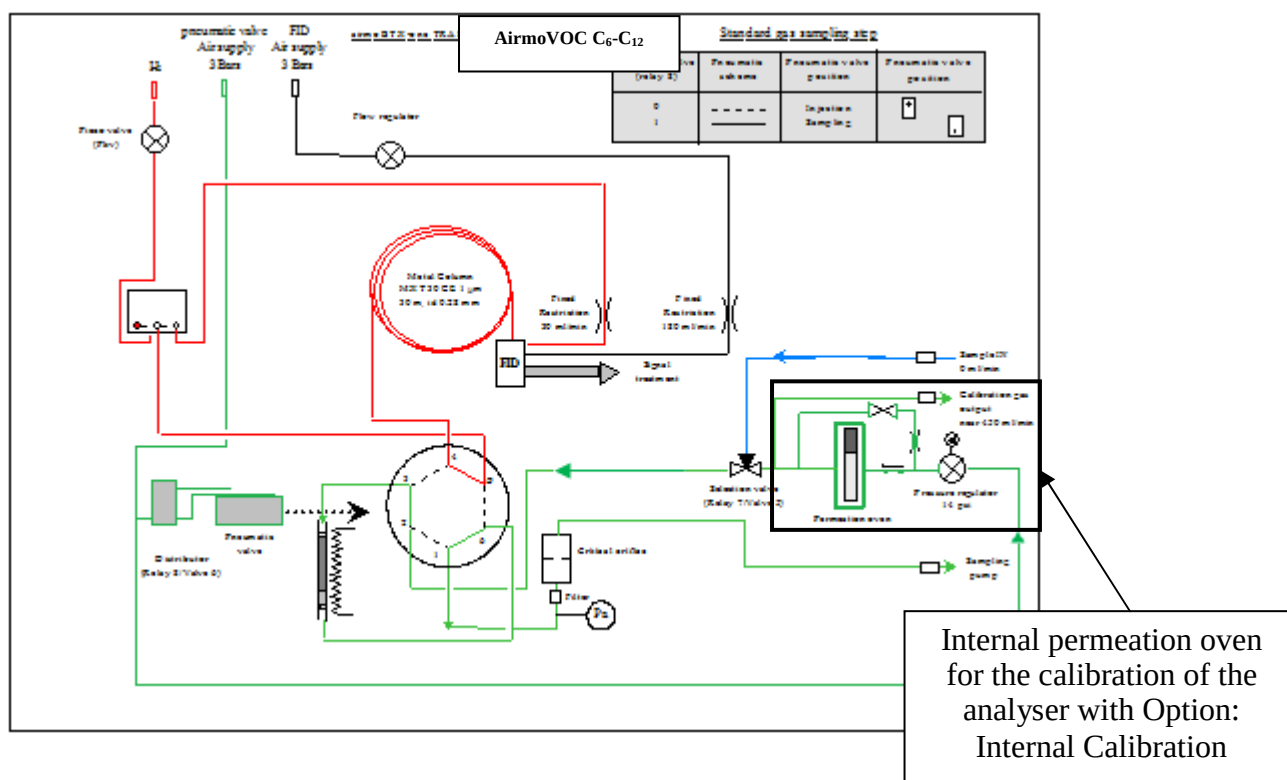
F.2. SCHEMATIC VISUALISATION OF GAS FLOWS DURING AN ANALYSIS CYCLE

F.2.1. SAMPLING STEP

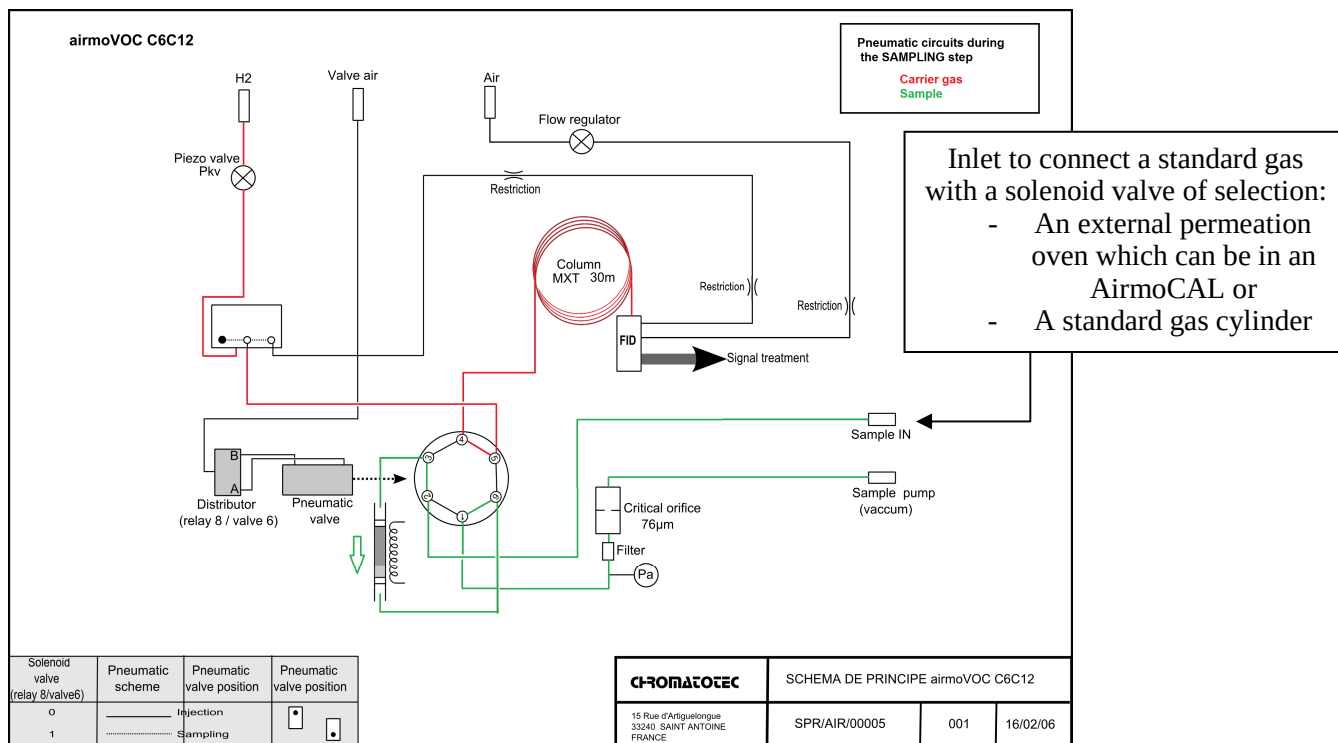
Ambient air sampling:



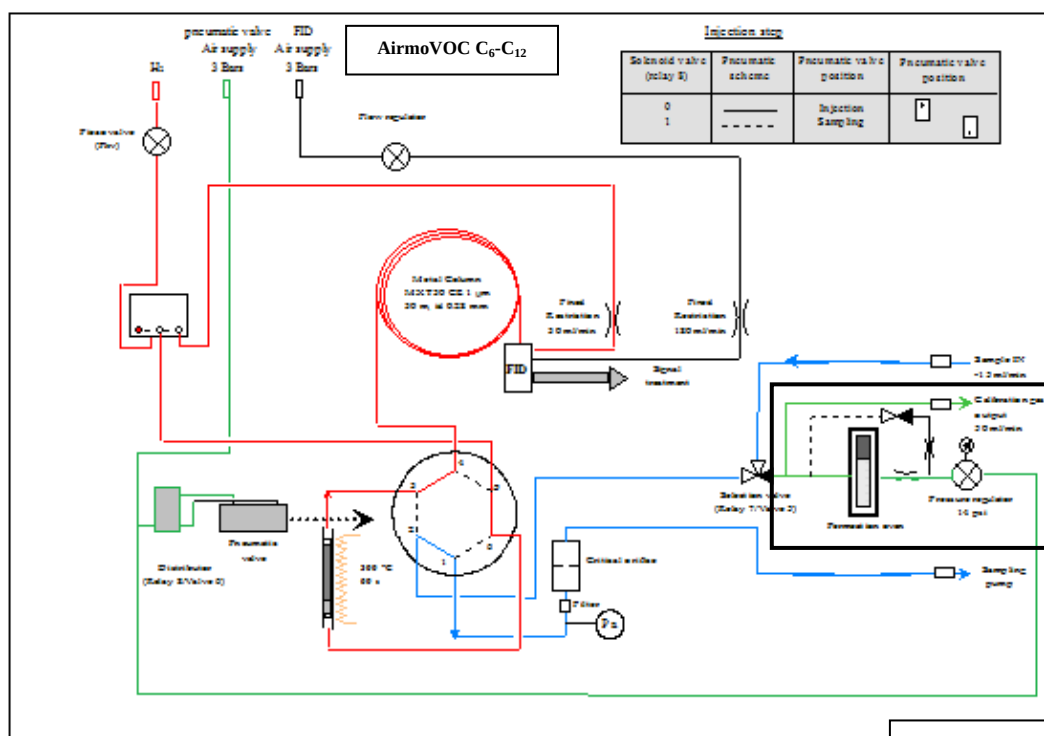
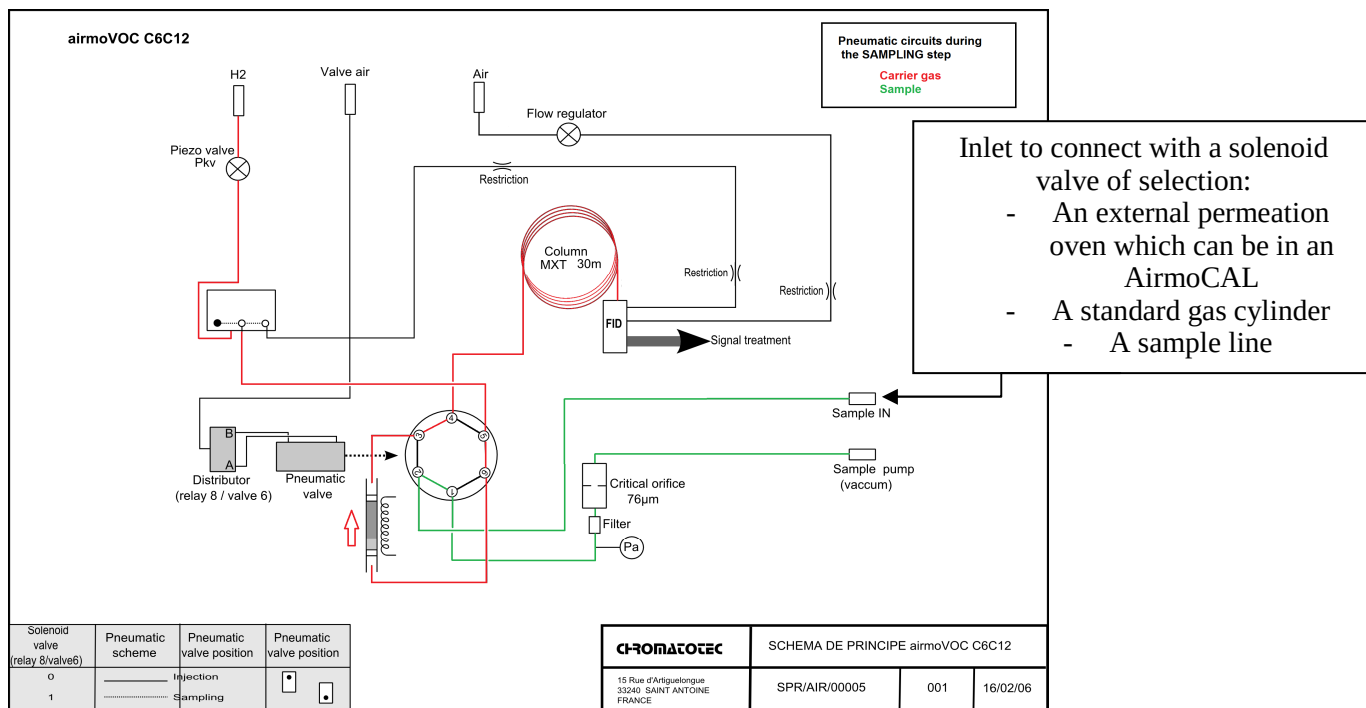
Standard gas sampling from internal calibration device:



Standard gas sampling from an external calibration device:



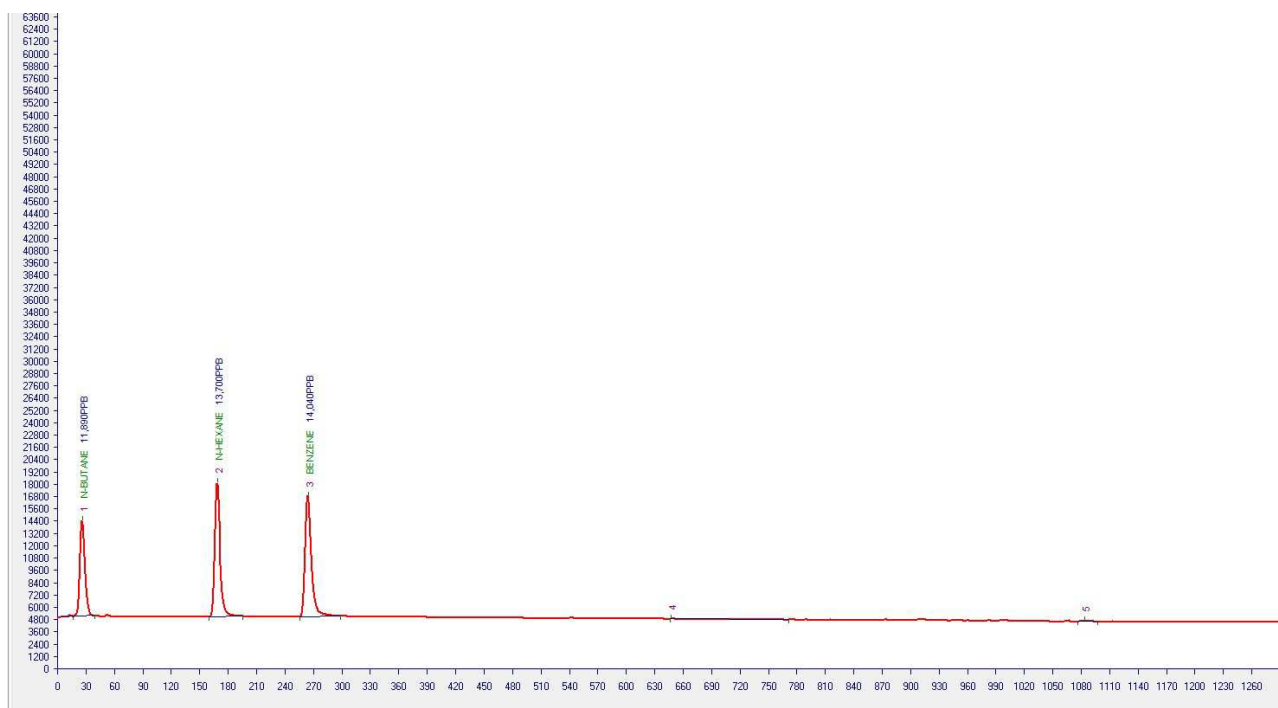
F.2.2. ANALYSIS STEP



Internal permeation oven for the calibration of the analyser with Option: Internal Calibration

- ◆ Standard gas analysis (with Internal or external calibration device)

Sampling duration: 600 seconds – Acquisition duration: 1200 seconds - program used: CALIB30MN.mth
External calibration device: AirmoCAL, dilution system with a permeation oven heated at 40°C and swept by total dilution air flow of 243.5 ml/min.



Operating conditions :									
Description : Permeation 10mins- xxxhPa									
Method Name : CALIB30M									
Substances Table Name : CAL#2077									
Sampling :									
Tube Number : 5									
Duration : 600 s									
Volume : 431,793 ml									
Date : 16/05/2013 20:49:48									
Detector :									
Amplification : 3-High									
Sensitivity :									
Base Sensitivity : 4500.0									
Peak List									
Substance	Result	Unit	Start (s)	R.Time (s)	Max	Stop (s)	Area	Type	FwMH
N-BUTANE	11.896	PPB	16.40	26.27	14630	38.80	55834.8	E	5.33
N-HEXANE	13.705	PPB	160.20	168.60	18366	195.80	88392.3	ST_E	5.80
BENZENE	14.041	PPB	255.20	264.40	16999	298.53	88645.7	ST_E	6.40
Filter									
☒ Remove unidentified peaks ☐ Display all peaks									

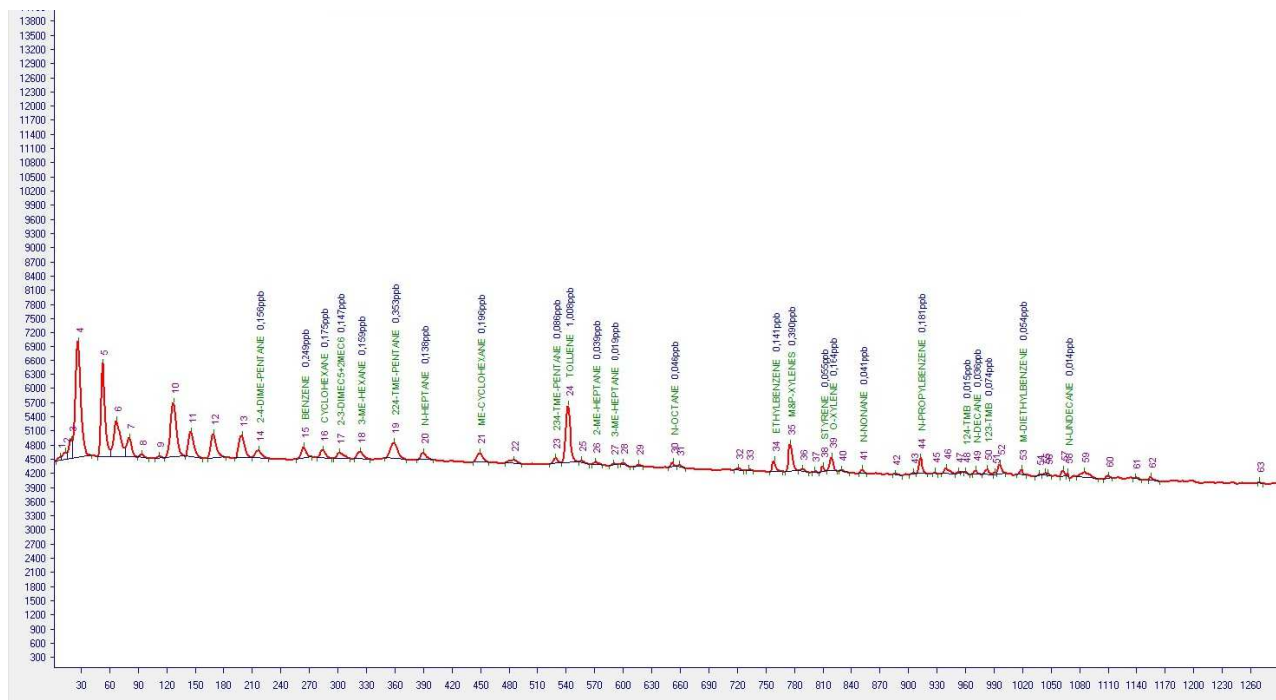
Sample: permeation oven containing:

- N-BUTANE at 14.22 ppb or 34.38 $\mu\text{g}/\text{m}^3$ (+/-10 %)
- BENZENE at 13.98 ppb or 45.42 $\mu\text{g}/\text{m}^3$ (+/-10 %)
- N-HEXANE at 13.80 ppb or 49.46 $\mu\text{g}/\text{m}^3$ (+/-10 %)

(Molecular volume at 20°C = 24.04 L.mol⁻¹)

◆ Ambient air analysis

Sampling duration: 1200 seconds – Cycle duration 1800 seconds – Acquisition : 1200 seconds
Program used : AMB30MN.mth



Operating conditions :

Description : Sampling 10 mins-xxxhPa
Method Name : AMB-30MN

Substances Table Name : CYLINDER

Sampling :

Tube Number : 5

Duration : 600 s

Volume : 423,969 ml

Date : 16/05/2013

Detector :

Amplification : 3-High

Sample Rate : 15 per second

Peak List

Substance	Result	Unit	Start (s)	R.Time (s)	Max	Stop (s)	Area	Type	FWMH
2-4-DIME-PENT	0,156	ppb	209,53	216,57	4715	226,60	1239,7	ST_E	6,67
BENZENE	0,249	ppb	256,53	264,53	4791	272,20	1542,2	ST_E	6,53
CYCLOHEXANE	0,175	ppb	278,40	284,63	4723	293,47	1171,3	ST_E	6,20
2-3-DIMEC5+2M	0,147	ppb	295,00	302,00	4660	313,07	1065,1	ST_E	8,60
3-ME-HEXANE	0,159	ppb	316,87	323,80	4688	333,47	1148,2	ST_E	6,80
224-TME-PENT	0,353	ppb	348,87	359,53	4878	372,20	3046,1	ST_E	7,93
N-HEPTANE	0,138	ppb	383,07	390,27	4660	400,47	1095,6	ST_E	6,60
ME-CYCLOHEX	0,196	ppb	441,80	449,47	4663	458,60	1458,1	ST_E	6,80
234-TME-PENT	0,086	ppb	521,93	529,07	4552	535,00	710,2	ST_E	6,20
TOLUENE	1,008	ppb	535,00	542,13	5667	552,93	7022,2	ST_E	5,20
2-ME-HEPTANE	0,039	ppb	566,87	571,07	4465	578,40	319,5	ST_E	5,00
3-ME-HEPTANE	0,019	ppb	585,67	589,93	4434	594,27	153,3	ST_E	6,33
N-OCTANE	0,046	ppb	647,67	652,33	4460	656,13	395,3	ST_E	4,13
ETHYLBENZEN	0,141	ppb	753,80	759,00	4490	767,27	1078,2	ST_E	4,00
M&P-XYLENES	0,390	ppb	770,53	776,20	4851	784,47	2987,0	ST_E	4,80
STYRENE	0,055	ppb	805,60	810,60	4378	814,00	410,4	ST_E	3,80
O-XYLENE	0,164	ppb	814,00	819,47	4567	825,07	1257,8	ST_E	3,87
N-NONANE	0,041	ppb	847,60	851,87	4315	856,20	367,3	ST_E	3,67
N-PROPYLBEN	0,181	ppb	907,87	913,00	4556	920,07	1573,0	ST_E	4,33
124-TMB	0,015	ppb	958,07	960,37	4264	964,20	122,7	ST_E	1,93
N-DECANE	0,036	ppb	967,53	971,07	4295	976,87	358,2	ST_E	3,47
123-TMB	0,074	ppb	976,87	982,63	4314	988,80	614,4	ST_E	4,80
M-DIETHYLBEN	0,054	ppb	1013,90	1019,00	4308	1024,00	490,5	ST_E	3,73
N-UNDECANE	0,014	ppb	1066,10	1067,50	4236	1069,70	137,0	ST_E	1,40

Filter

☒ Remove unidentified peaks

☐ Display all peaks

G. INSTALLING THE AIRMOVOC C6-C12

G.1. RECEIPT OF ANALYSER AND CHECK

Each analyser is inspected and packaged prior to transport with great attention. Immediately after receipt, we recommend to perform a quick visual inspection of the package. If the package is damaged, report it in writing to the carrier at the time of delivery.

The AIRMOVOC C6C12 is packed in a wood box with protection and maintaining foams placed above and below the analyser.

The AIRMOVOC C6C12 packaging extraction begins with the opening of the wood box; at this stage, it is possible to check the visual integrity of the analyser.

Any damages must be immediately identified and photographed; it should be reported to the carrier as well as to your local Distributor or to CHROMATOTEC.

For major damages, the AIRMOVOC C6C12 shall be returned to the manufacturer after synchronization with the service department, which can be reached by e-mail at: support@chromatotec.com.

In case of non-respect of this procedure, CHROMATOTEC cannot be kept in charge of the caused damage and cost will be charged to the customer.

G.2. ELECTRICAL SUPPLY

This instrument is supplied with 115 VAC or 230 VAC. See the identification plate on the rear face to confirm.

The supply must be able to deliver the following power:

230 – 50 Hz VAC (+/- 10 %) or 115VAC – 60 Hz (+/- 10 %)

Power: 400W

Fuse: 15A

Power uptake:

- Standby: approximately 80 W
- Normal operation: approximately 140 W
- Short duration peak: approximately 360 W.

These values are for guidance only. The actual power uptake varies with the maximum oven temperature, FID temperature and calibration plug-in unit.

G.3. GAS SUPPLY AND CONNECTIONS

G.3.1. WARNING

Hydrogen is used as carrier gas and as FID combustion gas. Follow safety and security regulation for this gas. Check all connections for tightness and leaks.

The gas supply tubing diameters must be sufficiently large so that the required inlet pressure at the instrument is maintained even under worst-case conditions (such as maximum gas flow rate at maximum ambient air).

All tubing used must be clean, debarred, and free of sward and dust. The use of virgin tubing is recommended. Tubing which has previously been in contact with liquids is not suitable. The following materials have proven themselves suitable:

- ♦ Hydrogen 5.6: stainless steel, **1/16”(in option 1/8”)**, HPLC grade.
- ♦ Zero air for FID and permeation tube inlet (with internal calibration): stainless steel, **1/8” (in option 1/4”)**, HPLC grade.
- ♦ Zero air for air actuator of the pneumatic valve: stainless steel, **1/8” (in option 1/4”)**, HPLC grade.
- ♦ EVENT of the standard gas: **1/8”**, grade not important.
- ♦ Sample inlet: glass, 10 mm, or PFA, **1/4”**.
- ♦ Pump: **1/4”** grade not important.

Before pressurising the tubing for the first time, all connections must be checked for correctness of assembly and leak tightness.

For a better stability of gas flows, it is recommended to put at the gas cylinders outlet double pressure release valves. These pressure regulators must be free of plastic (i.e. GC or ultra-high purity gas quality).

All gas supplies are controlled on the airmoVOC C₆-C₁₂. The use of unsuitable pressure-reducing valves would result in the entry of contaminating hydrocarbons into the measuring system, resulting in incorrect measurement values.

Gas and power supply connectors are on the instrument rear panel.

The following information refers to the values measured at the inlet connectors to the airmoVOC C₆-C₁₂.

G.3.2. HYDROGEN 5.6

Hydrogen is used as carrier gas and for Hydrogen FID Supply.

- ♦ Inlet pressure : **2 bar**
- ♦ Consumption for carrier gas : **≈ 3 ml/min**
- ♦ Consumption for FID Supply : **≈ 27 ml/min**
- ♦ Connector: **1/16**, stainless steel, swagelok.

G.3.3. ZERO AIR

Air is used for FID supply and for the pneumatic valve actuator.

- ♦ Inlets pressure : **3 bar**
- ♦ Consumption for FID Supply : **≈ 180 ml/min**
- ♦ Connectors: **1/8 ” (in option 1/4”)**, stainless steel, swagelok.

With option internal calibration:

Air is used also for the permeation oven:

- * Consumption for permeation oven: $\approx$ **50 ml/min** when the relay 7/Valve 5 is not activated and $\approx$ **250 ml/min** when it is activated.

The permeation tube needs to be placed in the oven before making the pneumatic connexion.

G.3.4. SAMPLE

a. Sampling system

An adequate vacuum supply is required to suck up the sample into the instrument and for the sample volume measurement.

- * Vacuum: **800 hPa** (200 hPa maximum at the vacuum outlet).
- * Pump flow: **1 to 2 l/min**.
- * Connector: **1/4"**, stainless steel, swagelok.

The gas sample must be made available at the instrument inlet ("Probe", 1/4" stainless steel, swagelok) under certain defined conditions. It must not contain any liquids. It is recommended that the sample be brought to the instrument through enough high dimensioned glass tubing (1/4" PTFE). Metal tubing should be kept as short as possible.

b. Sample

The sample gas must not contain liquids or particles.

If gas at high temperature and of high relative humidity is being sampled, condensation may occur in the instrument. This must be prevented by diluting the sample with dry gas.

In option, if there is a particle pollution of the atmosphere, filters can be used. The choice of the filter is done according to the level of pollution of ambient environment. If there is a lot of dust, you can use a 2 μ m filter. If there is not too much dust, you can use a 5 μ m filter.

If the ambient air is clean, it is not necessary to use filters to avoid risks of catching compounds into filters. The size of particles is not a problem for the column if some reach to go through.

A filter on the sample must not cause a pressure drop by more than 50 hPa.

The filter must be frequently changed, since the slightest accumulation of dust can lead to the absorption of some compounds in the sample.

All methods of sample filtering have some effect on the measurement. It is essential in all cases to check that sample compounds to be analysed actually get through the filter. (This can be done by making test measurement with standards before and after the filter and comparing the results).

Note: the dust must be removed by using a suitable fine glass wool or glass frit filter in the sample pass.

c. Standard gas (Internal or external calibration device)

An external or internal calibration system is used to monitor the stability of the analyser and so to validate the results. This system may consist in an external cylinder or an internal/external permeation oven.

Calibration is generally done with Benzene permeation tube. To follow the stability on heavy compounds, o-xylene permeation tube can be added.

The temperature setting of the permeation oven is: **45°C** or **40°C**.

The permeation tube included: **32 ng/min at 45°C (+/-10 %) or 15 ng/min at 45°C or 40°C (+/-10 %)**

The permanent air dilution flow: **≈ 50 ml/min** (when the relay 7 / valve 5 is off)
≈ 250 ml/min (when the relay 7/valve 5 is on)

The solenoid valve controlled by the relay 7/valve 5 is activated 120 seconds (in case where there is an internal permeation oven) or 300 seconds before the sampling start to be sure the total air flow for dilution is stabilized.

A VENT on the rear face permits to measure the permeation flow.

*Connector: **1/8"**, stainless steel, swagelok.

The permeation rate of the calibration tube will be included in the quality control report joined with the analyser.

G.4. SIGNAL AND DATA CABLING

Data cable: RS 232, 9600 Baud. Maximum permissible cable length: 15 meters
 Fiche 9 pole submin. Type D, male / female.

Analogue output: 0-1 V, 500 ohms output impedance
 Two 4 mm diameter banana plug sockets (black: -; red : +).
 Short circuits protection.

Switching output: Isolated relay switch controlled by CPU microprocessor.
 Switching capacity 100 mA at 24 V
 Two 4 mm diameter banana plug.

G.5. MECHANICAL INSTALLATION AND OPERATION POSITION

The usual lack of space in instrumentation cabins, vehicles and measurement stations results necessary in the installation of the various measuring systems in close proximity to each other. Despite this, it is essential to ensure that a sufficient supply of cooling air is available to the instrument at all times. Usually, cooler conditions are found in the lower levels of large systems. In no case an instrument with large power consumption should be placed directly below the airmoVOC C₆-C₁₂.

G.6. ENVIRONMENTAL CONDITIONS

The permitted ambient temperature range for operation of the instrument is **+18°C to +24°C**.

Do not forget that the internal temperature of the instrument is 5 to 8 °C higher than ambient. Therefore the lowest permissible oven temperature lies about 5 °C above ambient, an important point when operating at elevated room temperature, expect extended cooling times.

H. STARTING THE AIRMOVOC C6-C12

Before turning on the supply gases (hydrogen, air), you must check that the pressure reducing valves are turned off because the piezo valve and the pressure regulator are pre-adjusted and a big pressure variation is very dangerous for the pre-adjustments.

Check that all the tubes are connected correctly and without leaks.

- a) Set the Hydrogen pressure at **2 bars**
- b) Set the Zero Air pressure at **3 bars**.
- c) Switch on the sample vacuum pump.
- d) Switch on the airmoVOC C₆-C₁₂. The green LED "**OK**" and the red LED "**STAND BY**" light. It is possible that errors occurred before the instrument was last switched off. In which case, the error information have been saved by the system. In this case, the yellow LED "**ALARM**" or the red LED "**FAULT**" will light immediately after the instrument is switched on again. The error number will be send to the computer before or at the end of the first chromatogram. When the airmoVOC C₆-C₁₂- FID is switch on, the initial parameters are charged in the instrument. These parameters are :
 - * Oven temperature: ≈ 36 °C
 - * FID temperature : 170 °C (or 150°C for BTEX)
 - * Column pressure : ≈ 500 hPa

These parameters are fixed and should not be modified.

- e) In the same time, the PC is switched on. Windows "embedded" starts with **Chromatotec** user "pass word": **CETOMRIA** or **Administrator** user "pass word": **1234** and the PC open automatically the Vistachrom software. You select the "**super user**" level and you type **1234** as Password.
- f) Log on the instrument with and the PC .
- g) Load the working sequence with .
- h) Start the analysis with the touchpad . The first cycle permits to initialize the system.

To change the hour in Windows XP embedded of the PC, see the procedure: ([reference: SMO 0012-00 Clock Adjustement in Embedded Computer.pdf](#))

I. STOP THE AIRMOVOC C6-C12

In any case, before **SHUT DOWN** the power supply with the main **SWITCH** on the rear panel. It will be necessary to correctly stop the instrument. At the end of the method, wait some minutes until the LEDS "stand by" and "ok" are lit.

I.1. CLASSICAL STOP

- Click on the icon . In this case, the analyser stops at the end of the analysing method. Wait some minutes until the LEDS "stand by" and "ok" of the RS 232 board light before close Vistachrom software.
In any case, the LEDS "stand by" and "ok" of the RS 232 board must be lit.
- Wait the end of the cycle and wait for some minutes to obtain the initial parameters of the oven (36°C), **sampling off**, **Desorption of the TRAP**, etc. The reason is: the carrier gas is controlled by the piezo valve. If the instrument is shut down during the function, the piezo valve is closed and no carrier gas ways through the analytical column and the TRAP. It is a big cause of damage of these elements.
- LOG OFF the instrument with the icon .

BE CAREFUL, if the icon is yellow , the instrument is in function and doesn't be shut down. When the icon is blue , the instrument can be switch off.

- When the instrument is LOG OFF and in stand by position (the LEDS "stand by" and "ok" of the RS 232 board must be lit), no communication subsists with the software and the instrument can be switched off with the internal POWER SUPPLY
- When the oven temperature is near 36°C-38°C, LOG OFF the instrument with the icon . **BE CAREFUL**, if the icon is yellow, the instrument is in function and doesn't be shut down.
- When the instrument is LOG OFF and in **stand by** position (the LEDS "stand by" and "ok" of the RS 232 board must be lit), no communication subsists with the software and the instrument can be switch off.

I.2. EMERGENCY STOP

Sometimes, an error occurs during the functioning of the instrument, caused by the system or by a human manipulation. It is possible to completely loose or not the communication with the instrument. In this case, the only answer will be to make a RESET of the instrument and of the PC.

There are two possibilities:

I.2.1. SOFTWARE RESET

- **STOP THE MEASURE** at the end of the method on the ON LINE window with

the icon .

- Wait some minutes to obtain the initial parameters of the oven (36 °C), **sampling off, Desorption of the TRAP**, etc.

- **LOG OFF** the instrument with the icon .
- **CLOSE** the acquisition software **Vistachrom**.
- **START THE "ServiceGC" Software.**
- **Select the serial number of your instrument and the communication port.**
- **Click on the "LOG ON" button.**
- Click on **"RESET"** button (*Service GC*) the leds **"Stand By"**, **"Error"** and **"Ok"** on the RS232 Board must be lit.
- When the **"dialog activity"** icon blink, the instrument communicates with the PC and the user can transfer the Setup with the **"Transfert setup"** button. The led **"Error"** will be lit off.
- **Stop** the **"ServiceGC"** utility with the **"Close"** button.

- Restart **acquisition software Vistachrom** and **LOG ON** with .
- Load the working sequence with  and restart the analyser with .

Sometimes, software RESET is not sufficient and hardware RESET will be necessary.

I.2.2. HARDWARE RESET

- **STOP THE MEASURE** at the end of the method on the ON LINE window with

the icon .

- Wait some minutes to obtain the initial parameters of the oven (36 °C), **sampling off, Desorption of the TRAP**, etc. If the communication is impossible with the acquisition software, (use Service GC utility to STOP analyse).
- **SHUT DOWN** the instrument, open the COVER and disconnect the battery from the CPU board.
- **Wait for some minutes** to empty all the memory of the CPU board. **During this manipulation, it will be recommended to make a PC RESTART.**
- **Reconnect** the battery on the CPU board.
- **SWITCH ON** the instrument with the internal two positions switch. The leds **"Stand By"**, **"Error"** and **"Ok"** on the RS232 Board must be lit.
- **START** the **"ServiceGC"** Software.
- **Select the serial number of your instrument and the communication port.**
- **Click on "LOG ON" button.**
- The **Transfert setup** is automatic and the led **"Error"** will be lit off.
- **Stop** the **"ServiceGC"** utility with the **"Close"** button and **Restart** the acquisition software **Vistachrom**.

- **LOG ON** the instrument with  and Load the working sequence with the icon  and start the measure with the icon .

After a RESET, the first cycle only permits to initialise the instrument. There is no TRAP desorption, no acquisition during this cycle, etc.

J. ANALYSER CALIBRATION

J.1.BASE SENSITIVITY

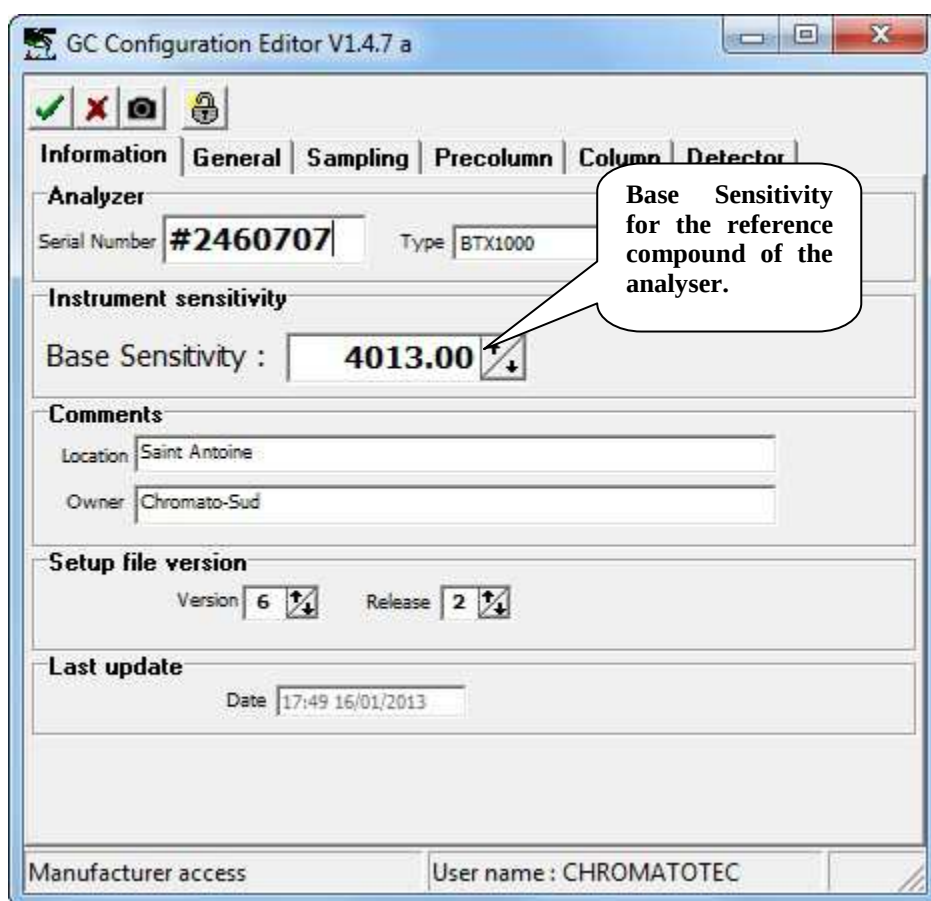
AirmoVOC analysers are calibrated with a sensibility factor called **Base Sensitivity (BS)**.

This factor is calculated in area units per nanogram of a reference compound adsorbed on the TRAP.

The BS is the area of the signal produced by 1 nanogram of Benzene (Reference compounds for an airmoVOC C₆-C₁₂, an airmoBTX or an airTOXIC).

How to access to the Base Sensitivity:

Click on the "GC parameters setup" icon , select tab "Information". The next window appears:



GC Configuration Editor V1.4.7 a

Information | General | Sampling | Precolumn | Column | Detector

Analyzer

Serial Number: #2460707 Type: BTX1000

Instrument sensitivity

Base Sensitivity : 4013.00

Comments

Location: Saint Antoine

Owner: Chromato-Sud

Setup file version

Version: 6 Release: 2

Last update

Date: 17:49 16/01/2013

Manufacturer access User name : CHROMATOTEC

In this example, the factor BS = 4013 ua/ng Benzene

This is the **original value of BS** for this analyser.

With a FID detector, the BS value is around 4500 (+/- 600) ua/ng Benzene

J.2.CALIBRATION STABILITY MONITORING

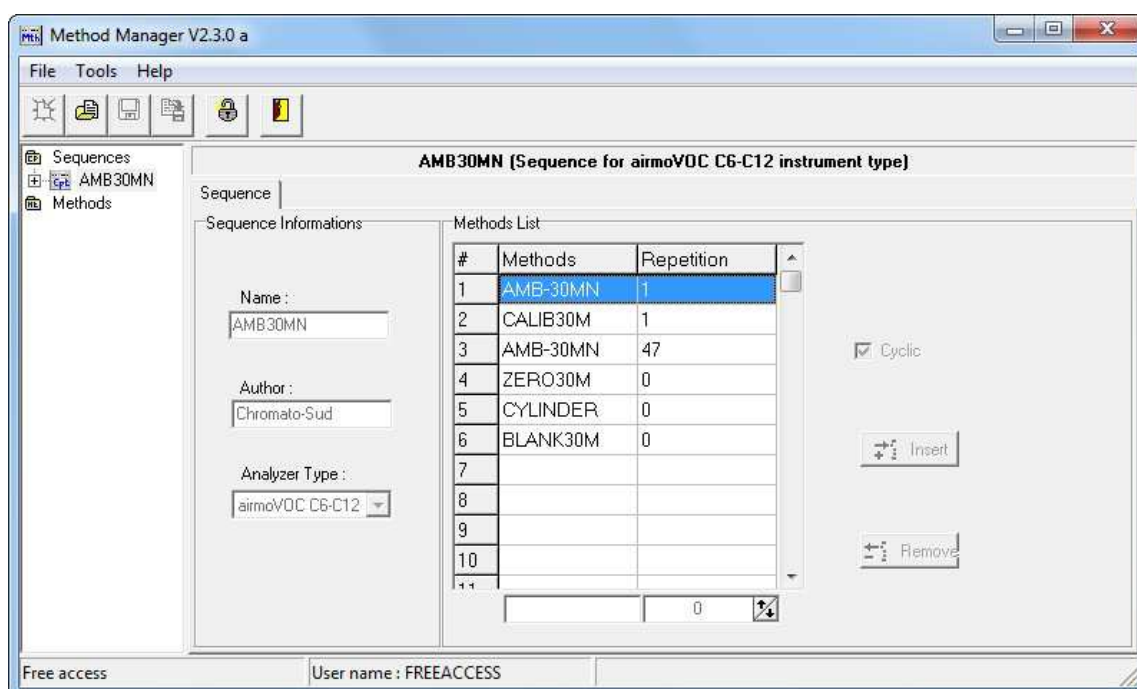
With internal or external calibration device:

- Internal permeation oven
- External permeation oven, like airmoCAL device for example

It is possible to follow the stability of the Base Sensitivity.

Calibration analysis is a method included into the analysis sequence.

- Example of working sequence:

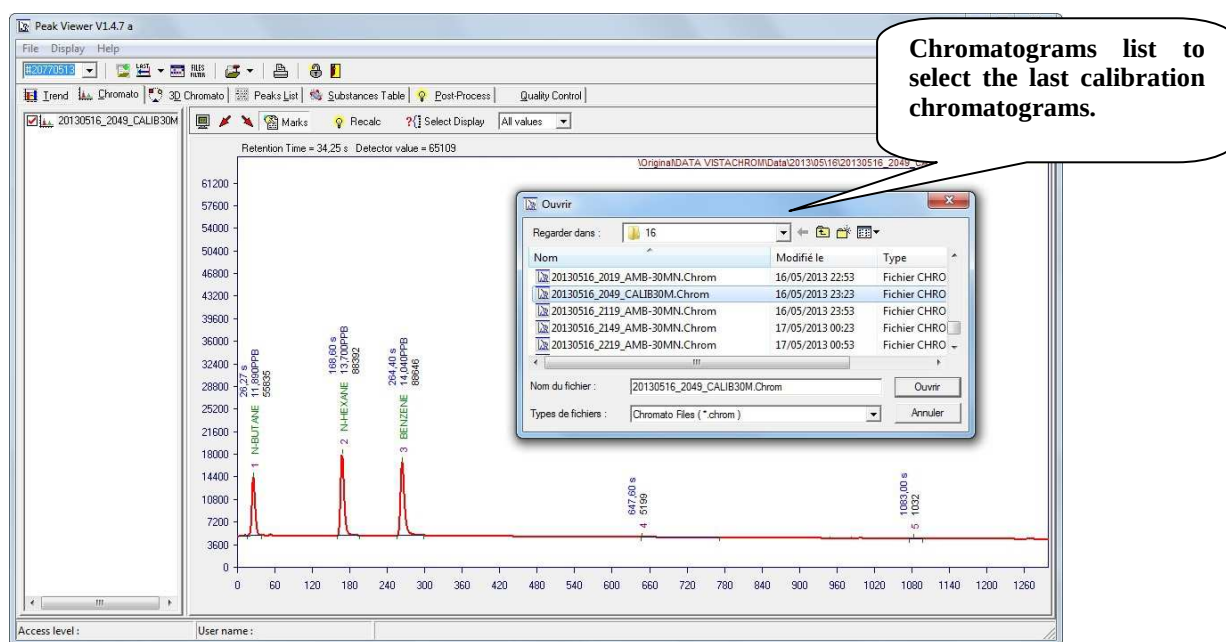


This routine working sequence is cyclic and it's composed of: 1 ambient air measurement, 1 internal calibration measurement and 47 ambient air measurement.

Each working method has a total duration of 30 minutes. Each analysis method gives a chromatogram.

In this case (with 30 minutes cycle), the standard gas is analysed once a day.

You can read the results in Peak Viewer Software (refer to *Easy Start*)



To calcul the new BS “Base Sentitivity”:

In Peak Viewer software, open the last calibration chromatogram; in this example, it is called [20130516_2049_CALIB30M.Chrom](#)

Select the TAB Peak List:

Operating conditions : Description : Permeation 10mins- xxhPa Method Name : CALIB30M Substances Table Name : CAL#2077 Sampling : Tube Number : 5 Duration : 600 s Volume : 431.793 ml Date : 16/05/2013 20:49:48 Detector : Amplification : 3-High Sample Rate : 15 per second Sensitivity : Base Sensitivity : 4500.0									
Peak List									
Substance	Result	Unit	Start (s)	R. Time (s)	Max	Stop (s)	Area	Type	Fw/MH
N-BUTANE	11.886	PPB	16,40	26,27	14630	39,90	55834,8	E	5,33
N-HEXANE	13,705	PPB	160,20	168,60	18366	195,80	88392,3	ST_E	5,80
BENZENE	14,041	PPB	255,20	264,40	16999	298,53	88645,7	ST_E	6,40

Filter
☒ Remove unidentified peaks ☐ Display all peaks

In this example, the concentration measured for the Benzene standard is 14.04 ppb or 45.62 $\mu\text{g}/\text{m}^3$ (**with a molecular volume of 24.04 l.mol⁻¹ at 20 °C**) (C_C) and the area of peak is 88645.7 ua. The BS used to calculate this concentration was 4500 ua/ng_{Benzene} and the volume of the sample is 431.793 ml.

$$BS = [\text{Area} / (C_C \times V)] \times 10^{-3}$$

C_C : concentration calculated in $\mu\text{g}/\text{m}^3$
 V : volume of the sample in m^3

N.A:

New BS = $[88645.7 / ((45.62 \times (431.793 \times 10^{-6})))] \times 10^{-3} = 4500.15$ rounded to **4500 ua/ng**
The BS of the analyser didn't change: the calibration is stable.

J.3.USING AN EXTERNAL STANDARD GAS FOR CALIBRATION

Calibration with a standard gas cylinder 10 ppb to 100ppb:

- 1) Stop the analyser at the end of cycle
- 2) Purge 3 times (minimum) the manometer of your cylinder
- 3) Connect the solenoid valve to the analyser power board (5th position, Valve 3, Fig 2)



Fig 2: Control relay of the power board

Connect the external solenoid valve to the connector #5 (valve 3) of the analyser power board. This external solenoid valve permits to select the standard gas from the cylinder as sample.

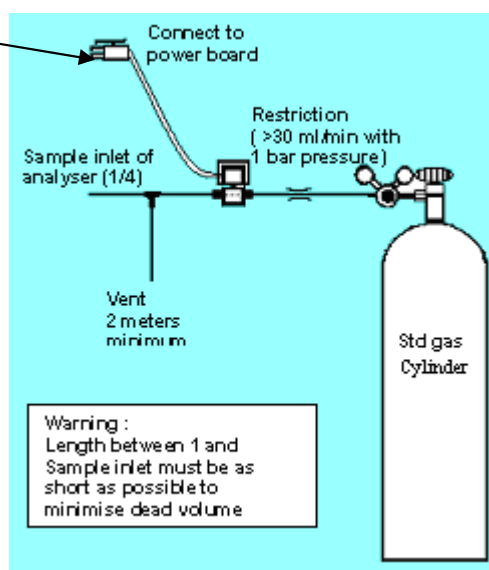


Fig 3: diagram of XXvalveCAL device

- 4) Measure the flow of standard gas before the external solenoid valve (30ml/min see Fig 3) and connect the device to the sample inlet of the analyser.

WARNING: you must respect the diagram (vent, flows...)

- 5) Select and load the calibration sequence in VISTACHROM (Ex : Calibrat.CPT)

This working sequence permits in a first time to calibrate with precision the analyser and in a second time to certify the permeation tube. This sequence is not cyclic so the analyser will stop at the end of the sequence.

- 6) Start the analysis and wait for the analysis results.

Go in Peak Viewer software and compare calculated concentrations with expected concentrations. (see next part K.READJUSTMENT OF CALIBRATION).

K. READJUSTMENT OF CALIBRATION (PARAMETER BS)

How to calculate the New Base Sensitivity:

As it is mentioned before (J.2 CALIBRATION STABILITY MONITORING)

$$BS = [\text{Area} / (C_C \times V)] \times 10^{-3}$$

C_C : concentration calculated in $\mu\text{g}/\text{m}^3$
 V : volume of the sample in m^3

If the concentration calculated is not equal ($\pm X \%$) to the concentration expected (C_E), you have to change the value of the base sensitivity:

$$\text{New BS} = BS \times (C_C / C_E)$$

For internal or external calibration analysis (permeation tube of standard gases analysis), the concentration expected is in the Quality Control document (permeation rate and dilution flow).

Example: Expected concentration is $110 \mu\text{g}/\text{m}^3$ (C_E) and you have measured 119.72 (C_C) with a BS of 4244 (ua/ng).

$$\text{New BS} = 4244 \times (119.72 / 110) = 4619.0 \text{ rounded } 4620 \text{ (ua/ng)}$$

How to change the Base Sensitivity value:

- 1) You must be identified by **Vistachrom** with Super User name (Password: 1234)



- 2) Stop the analyser **at the end of cycle**.
- 3) Click on the “GC parameters setup” icon , Tab “Information” (See Fig1)
- 4) Change BS by the New BS and click on OK to validate the configuration.
- 5) Start the analysis.
- 6) Check if the New BS is taken into account to calculate the new concentrations at the end of analysis.

L.PERMEATION TUBE REPLACEMENT (WITH INTERNAL OR EXTERNAL CALIBRATION DEVICE)

When the user has to replace the permeation tube, the procedure is:

- The used permeation tube will have a permeation rate around 32 ng/min at 45 °C or 15 ng/min at 45°C or 40°C (precision +/- 10 %).
- Stop the analyser and stop the sampling pump.
- Insert the new permeation tube in the oven installed inside the analyser.
- Test the gastight of the permeation oven by plugging the VENT.
- Measure the air dilution flow with a flowmeter on the VENT.
- Switch on the analyser but don't start the measurement. Leds **STAND BY** and **OK** light.
- Log on the analyser with the "service GC", and activate the relay 7/valve 5 to have a measurement of the total air dilution flow on the vent.
- Calculate coarsely the concentration of the permeation tube. For example: Tube of Benzene with a permeation rate of 32 ng/min at 45°C and a total dilution flow of 250 ml/min.

The benzene concentration will be:

$$\frac{32}{0,250} = 128 \text{ ng/l or } \mu\text{g/m}^3$$

The molecular weight of benzene is 78, 11 g/mol and the molecular volume at 20°C is 24, 04 l.mol⁻¹

The concentration of the permeation tube in ppb will be:

$$\frac{128 \times 24,04}{78,11} = 39,4 \text{ ppb}$$

- **Log off Service GC and log the GC on Vistachrom.**
- **The user will wait for some hours before using the calibration method to have a stabilized permeation tube.**
- **Switch on the sampling pump.**
- Load the working sequence and start the analysis without activation the auto-calibration option. A new base sensitivity will be calculated but not updated in the GC Configuration.
- Open the viewer and reprocess the 4 stabilized calibration chromatograms obtained with the substances table of the ambient air method.
- With the viewer, select the RECALC button to have the concentration measured by the analyser.
- If the reprocessed calibration analyses give for example 39.5 ppb, 40.1 ppb, 40.2 ppb and 40.0 ppb, the mean concentration is 39.95 ppb rounded to 40.0 ppb.
- Open the Configuration Setup and note the original base sensitivity and make the next calculation :

Mean concentration obtained after chromatograms re-identification: 40.0 ppb

Theoretical concentration: 39.4 ppb

Original "Base sensitivity": 4000 (ua by ng)

The new base sensitivity is:

$$\frac{40,0 \times 4000}{39,4} = 4060,91$$

The new Base sensitivity will be updated in the Setup GC configuration. In this example, the value will be: 4060.

M. TROUBLE SHOOTING GUIDE

For any problems, please look at our customer service website <http://support.chromatotec.com> using your password.

If you don't have the password, contact our customer service:

Email: support@chromatotec.com

Tel: 0033 (0)5 57 94 06 26

CHROMATOTEC Group / airmotec	USER MANUAL STANDARD SMU n° 206-3-03	Application date : 5 June 2013
		Version : N° 00

AIRTOXIC GC 866

Historic

Version N°	Nature of modification	Application date	Chapters modified
00	Creation	5 June 2013	All

Redactor : LANDART Sandra	Checked by : Mickael Gezat Benoit Calatayud	Approved by : Michel Robert
Visa :	Visa :	Visa :

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WARNING

The described material in this manual contains one or several confidential computer programs that are the property of CHROMATOSUD.

CHROMATOSUD authorize the instrument owner to use the program (s) for what it has been designed to the exclusive of any other use.

The total or partial copyright, the dismantle, the retro-compilation or transcription or the transmission of mentioned earlier programs for the use of the owner or a third party are strictly forbidden.

WARRANTY

CHROMATOSUD guarantees these instruments against the manufacturing defaults during a twelve month period from the delivery date. The replacement of the defective components will be free except the transport or travel fees that will be invoiced according the current tariffs.

CHROMATOSUD accepts no liability for damages or possible incurred losses.

CHROMATOSUD provides a spare part service and After Sales Service. Please contact the service engineer responsible for the repair or the spare part repair. The serial number of the instrument as well as the description of the trials done and the estimated reasons of the breakdown should be given to provide you the quickest service.

CHROMATOSUD reserves the right to modify the prices and the characteristics of these products.

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CAUTION for all manipulation HIGH VOLTAGES inside the instrument

Don't open the alimentation box because there is the presence of high voltage until 1500 V.

A. OBJET

User's manual for the analyser airTOXIC: presentation of the analyser, operating principle, installing, starting and stop of the analyser, calibration and troubleshooting.

B. APPLICATION FIELD

Analysers airTOXIC.

C. DEFINITIONS

D. REFERENCE DOCUMENTS

Vistachrom user manual 1.47 (reference: **SMQ 0004-10 GCSV 147 UK.pdf**)

Installation and starting manual of an PID analyser (reference: **SMU 206-3-220-00-01 Installation and starting Manual PID.pdf**)

Easy start airTOXIC with internal calibration (reference: **easy start air tox73.UK.pdf**)

Easy start airTOXIC Std (reference: **easy start airTOXIC-STD-74022-UK**)

Easy calib airTOXIC Std (reference: **EASY CALIB airTOXIC-STD A74022-UK.pdf**)

Easy calib airTOXIC with internal calibration (reference: **EASY CALIB airTOXIC Calib A73022-UK.pdf**)

E. AIRTOXIC WITH INTERNAL PC 5U - PRESENTATION

E. 1. INTRODUCTION

The airTOXIC is a high performance gas chromatograph with photo ionization detection (PID) and an on-line sample preparation. It is designed for the analysis of BTEX compounds (Benzene, Toluene, ethyl-benzene, m&p-xylenes and o-xylene) in gaseous samples, in ambient (100 ppt) to emission (ppm) concentration ranges. The miniaturisation, the inertia to chemical compounds, the mobility and flexibility of this analyser have been optimised.

Thanks to an integrated CPU board allowing a dialogue with a PC, this analyser is an automate.

The chromatography software allows:

- A complete automation of the system.
- The signal acquisition, and data treatment.
- Data displayed by Peak Viewer software
- The peak identification thanks to a reference substance table.
- Data saving on the hard disk.
- Trend creation allowing a visualisation of the evolution of selected peak retention times and surface (or concentration of the corresponding compounds).

This compact instrument only requires little space, power and gas (Nitrogen) when compared to conventional systems. Thanks to its high level of automation, it is suitable for continuous pollution monitoring. Therefore, the airTOXIC is suitable for in-situ operation.

E. 2. GENERAL CHARACTERISTICS

Model: airTOXIC A73022

Pneumatic valve: 6 ports 1/8" (A 6UWP)

Replacement rotor: SSA-6-UWP

Analytical column: Capillary metallic column, length: 30 m ref.: MXT30CE

Detector: Photo ionisation detector (PID)

Carrier gas: Nitrogen (quality 5.5 minimum)

Lamp cleaning: zero air or nitrogen

Trap: L = 8 cm; id= 1.5 mm

Critical orifice: 50 µm

Supply voltage: 115VAC or 220 VAC

Vistachrom software

Dimension: 19", 5U

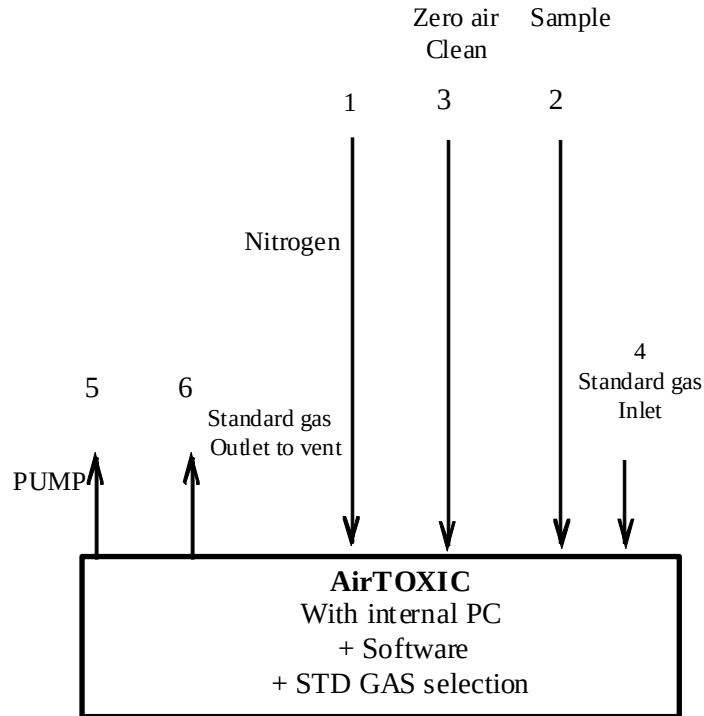
Weight: 25 kg (packed: 45 kg)

Option: Internal permeation oven

ORIGIN COUNTRY: FRANCE

CHROMATOTEC Group / airmotec
15, Rue d'Artiguelongue
33240 SAINT -ANTOINE
FRANCE

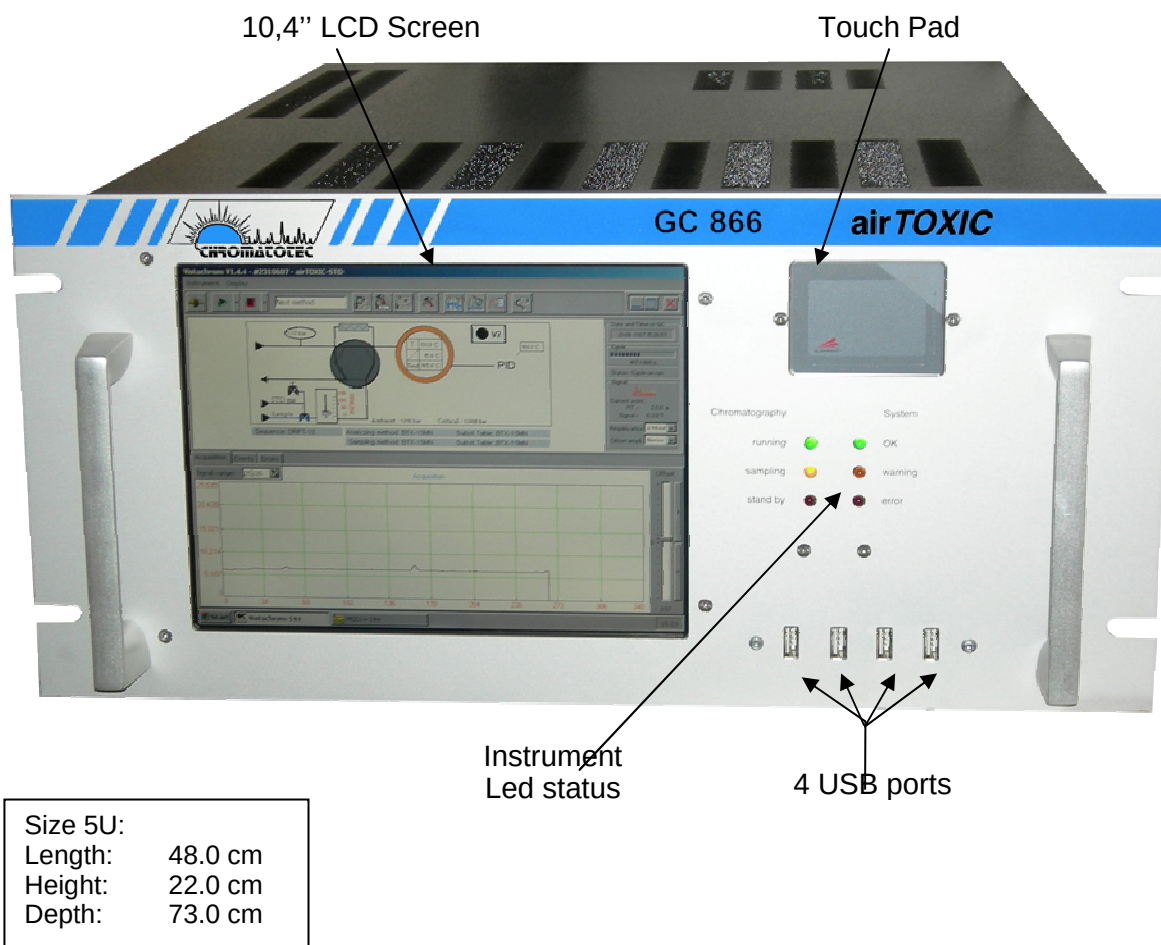
E. 3. FUNCTIONAL DIAGRAM



Legend:

- 1** Nitrogen inlet to connect a cylinder (not included) 1/8" stainless steel, swagelok
- 2** Sample inlet (ambient air...). 1/4" stainless steel, swagelok
- 3** Zero air inlet (for auto cleaning and internal permeation oven) to connect a cylinder or a compressor, 1/8" stainless steel, swagelok
- 4** Standard gas inlet, 1/8" stainless steel, Swagelok for external calibration (to connect a standard gas cylinder or an external permeation oven)
- 5** Sampling pump 1/4" VACUUM, stainless steel, Swagelok
- 6** Standard gas outlet, 1/8" to connect on A VENT, stainless steel, swagelok.

E. 4. FRONT FACE



With the USB Port, you can connect a mouse and a keyboard to an easy using of the internal pc.

The front face of the analyser presents:

- 6 LEDS indicating the state of the Check. 3 concern the chromatograph and 3 the communication with the PC.

Cycle:

"**Running**": the green LED is lit during the acquisition.

"**Sampling**": the yellow LED is lit during sampling when the sample flow is set by a critical orifice.

"**Stand by**": the red LED is lit when the system is in stand-by.

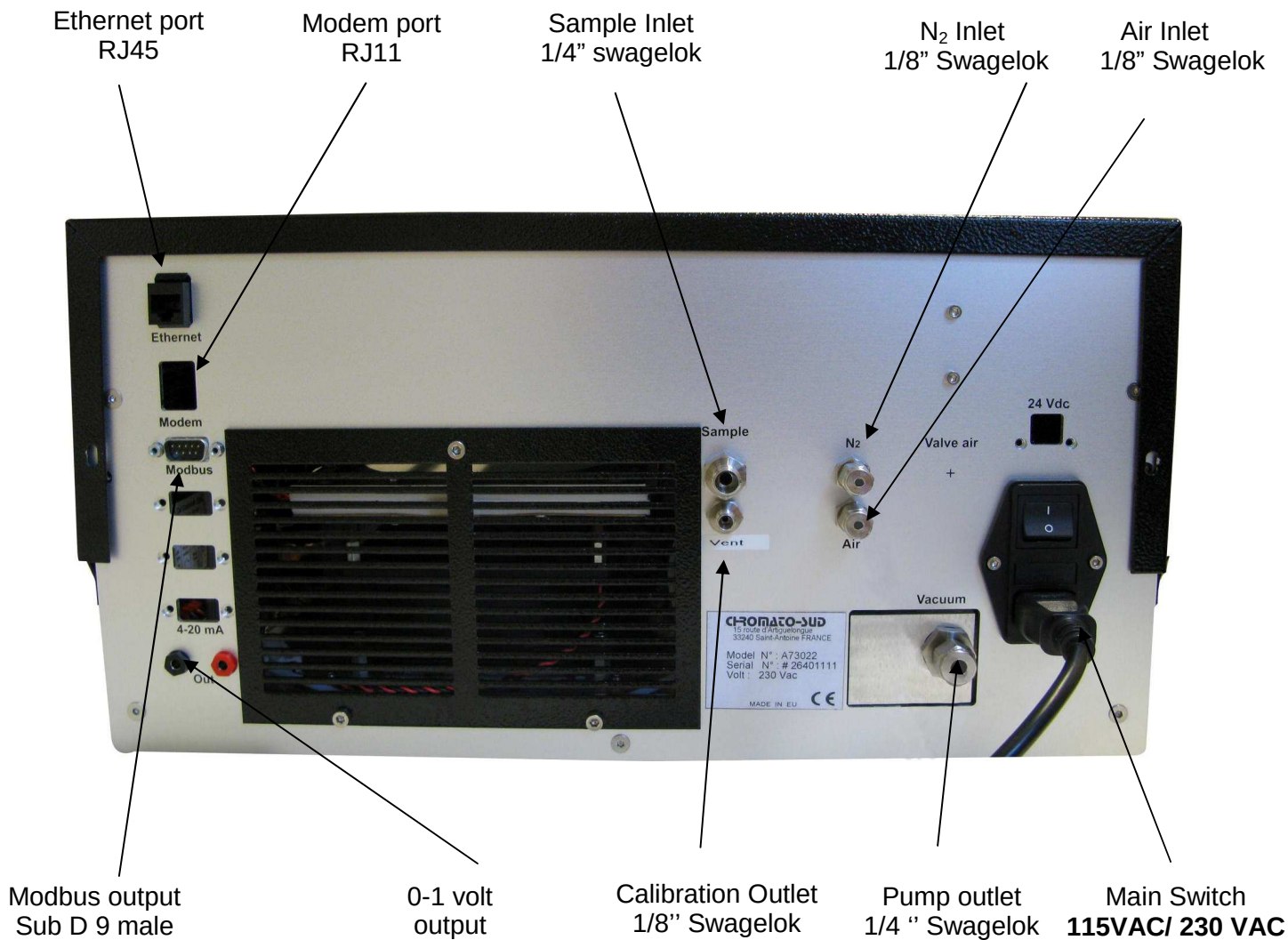
System: A2 communication protocol (when the analyser is connected to Acquisition software and when Acquisition software is in the on-line window)

"**OK**": the green LED is lit when the communication between analyser and PC is correct.

"**Warning**": the yellow LED is lit to indicate something is wrong. For example, if an acquisition is running and if the software is not on the on-line menu (the acquisition is lost) (error number 1xx).

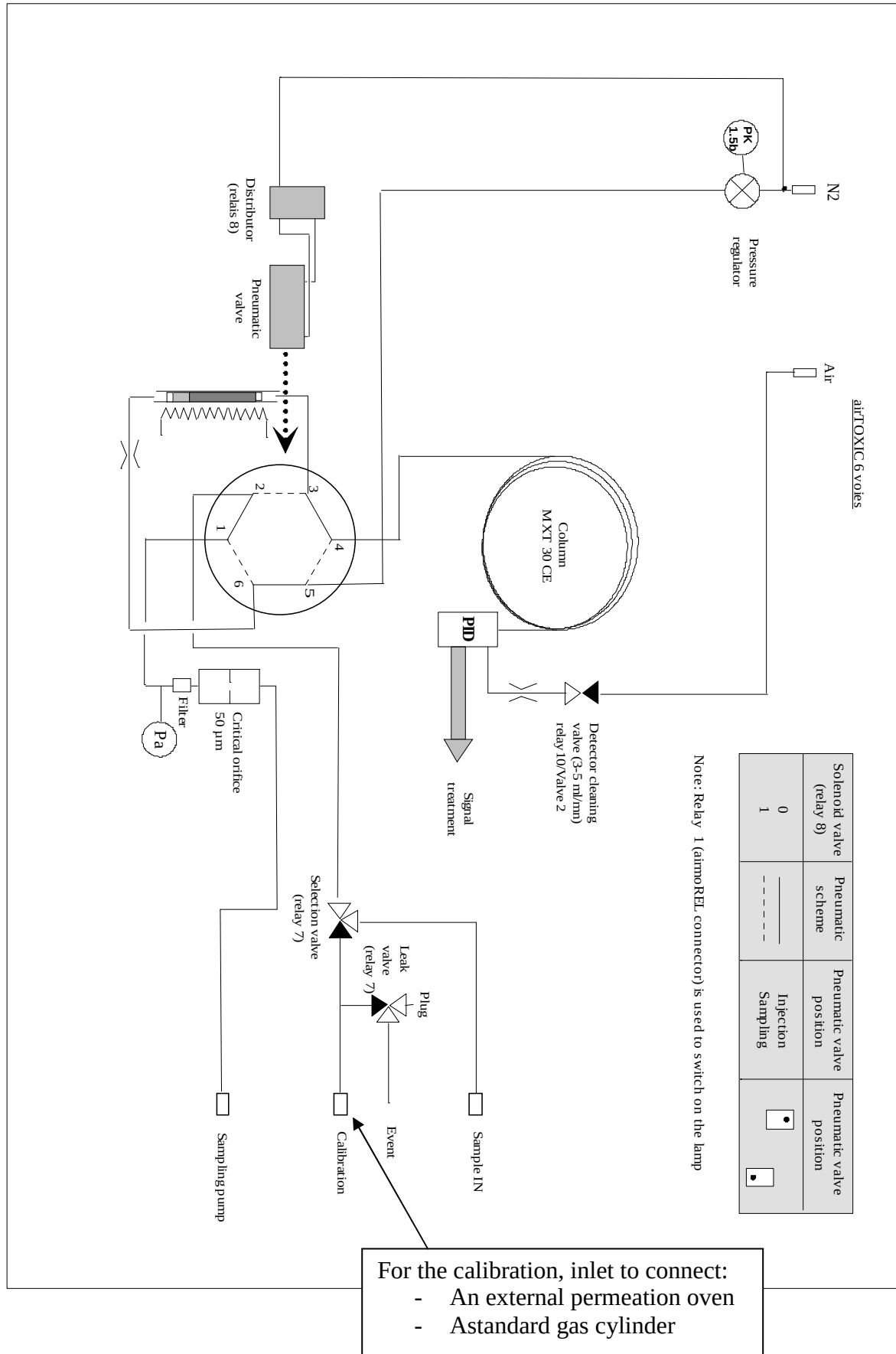
"**Error**": the red LED is lit when an important error has occurred (Error number 2xx).

E. 5. REAR FACE

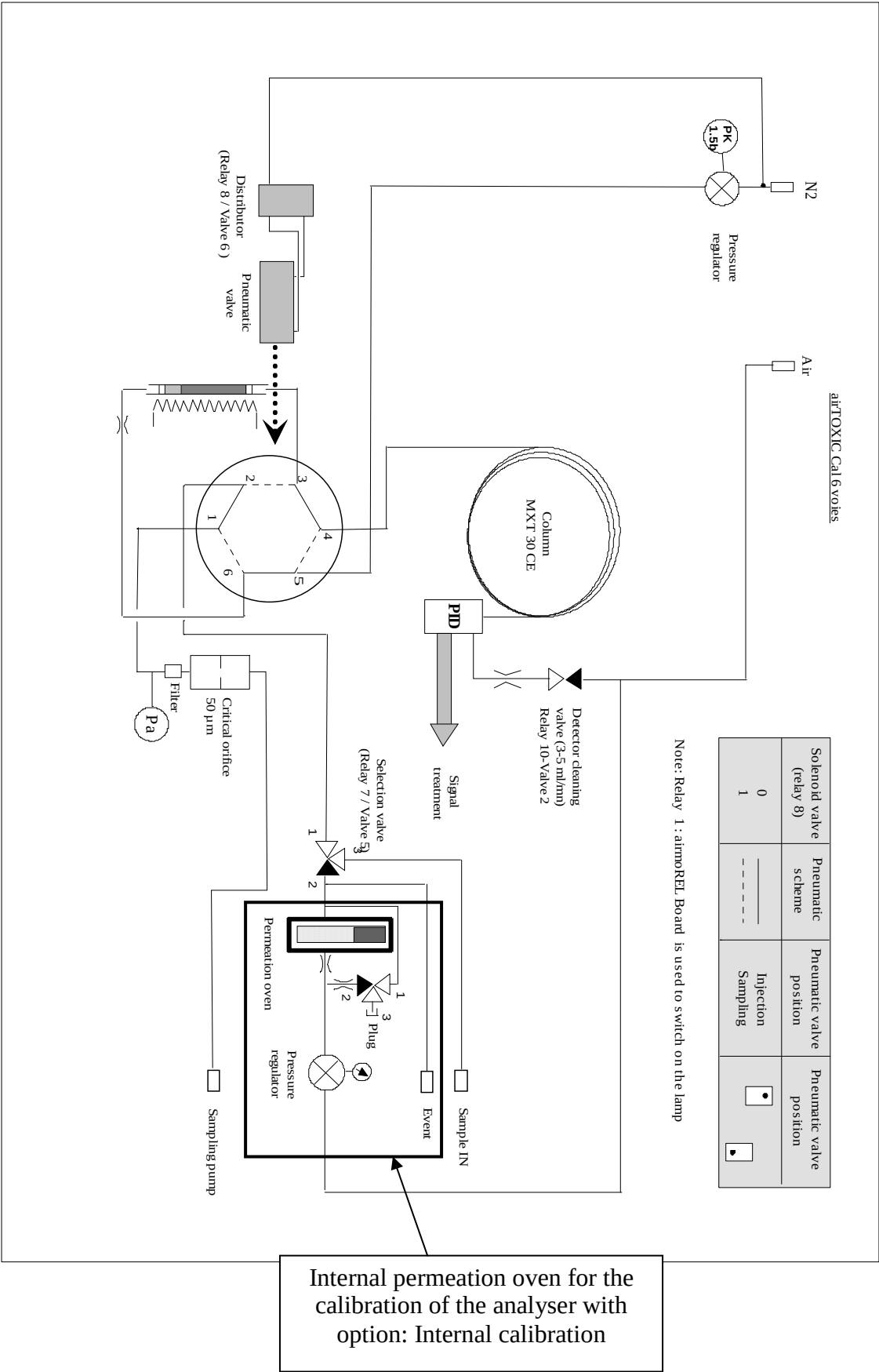


Size 5U:	
Length:	42.5 cm
Height:	21.0 cm

E. 6. PNEUMATIC SCHEME OF AIRTOXIC



E. 7. PNEUMATIC SCHEME OF AIRTOXIC WITH INTERNAL PERMEATION OVEN AS OPTION: INTERNAL CALIBRATION



F. OPERATING PRINCIPLE OF THE AIRTOXIC

F. 1. MEASURING PRINCIPLE

F. 1. 1. INTRODUCTION

A complete cycle of analysis is done in two successive steps.

- The first stage is the sampling step: it consists to pre-concentrate the VOC contained in the ambient air or in the standard gas. The gas sample is drawn by an external pump through a trap, a fine tube containing porous substances, which extracts the gas components according to their affinity with these phases. For example, permanent gases and water vapour are not retained. The trap phase is chosen so as to trap from the C6 to C10. It is possible, if required, to add to the sample flow an exactly known amount of reference standard compounds. The volume of gas sample (ambient air or standard gas) is measured downstream of the adsorption section, thanks to a critical orifice which fixes the flow and thanks to the sampling time. At the end of the sampling, a relay commutes directing the sample flow to the vent. The sampling flow is set in the instrument by a critical orifice of 50 μm . The sampling flow is about 10 to 25 ml/min.
- The following stage is the analysis step: The trapped VOC are injected in the analytical column by thermal desorption during few minutes (depending on the cycle duration). Next the VOC are separated by the analytical column and detected by the PID.

F. 2. 1. SAMPLING (CONTROLLED BY RELAY 8/VALVE 6 OF POWER BOARD)

a) Introduction

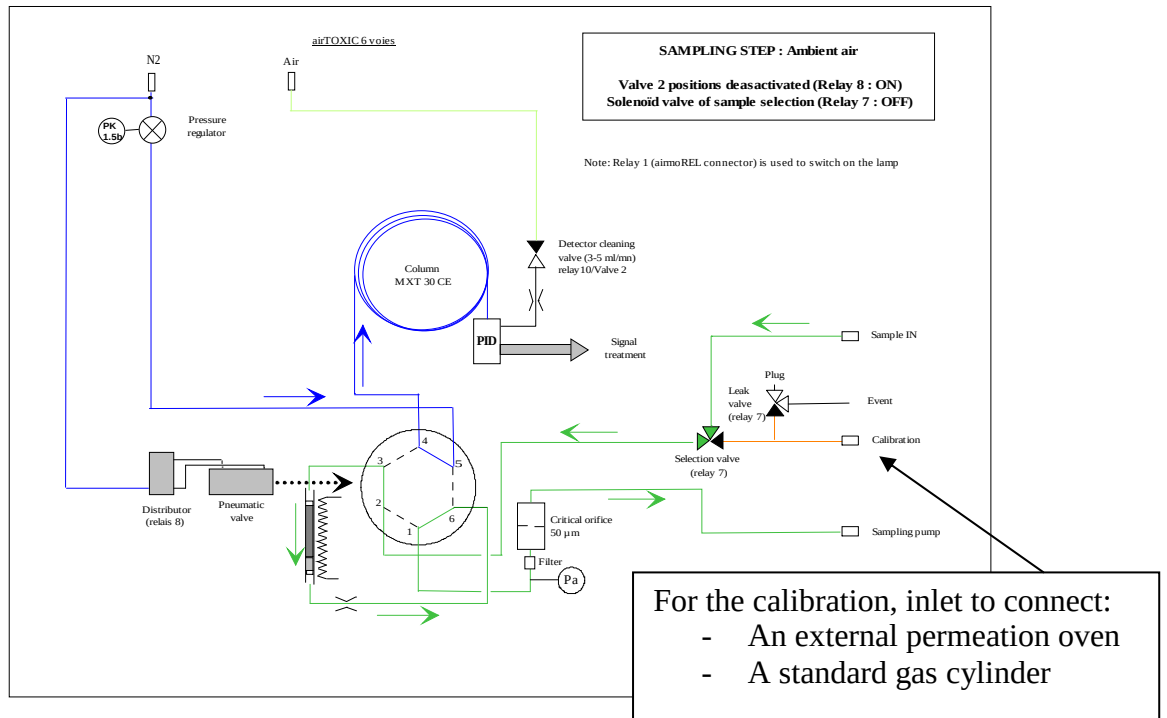
These "transfer line" will have to be as short as possible to avoid a sample condensation. The entrance pressure of the sample must be near the atmospheric pressure so that the measurement of the volume sampled by the analyser is correct. This measurement is made thanks to the Pa board and depends on the dimension of the critical orifice. When the analyser is in phase of sampling step, the Pa board must measure the same pressure whatever the sample entering the analyser.

b) Ambient air sampling (no selection relay activated)

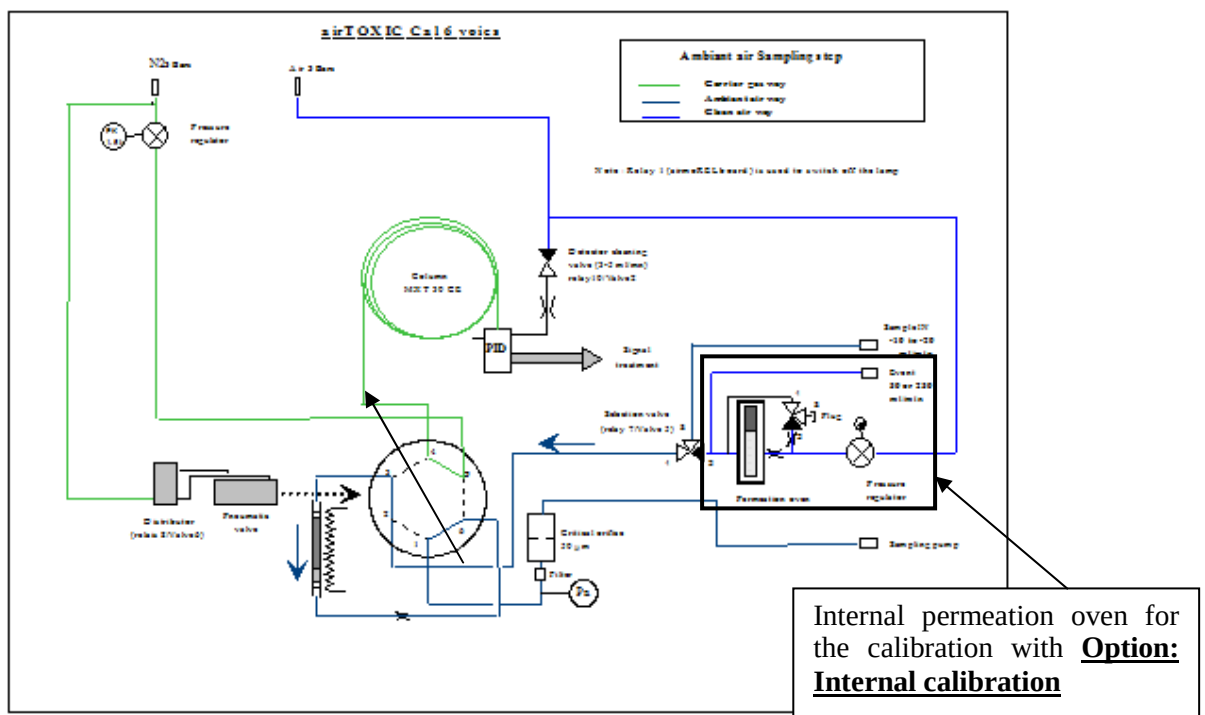
The gas sample to be analyzed must be connected on the connection $\frac{1}{4}$ ", swagelok which is on the rear face and which is named " Sample Inlet ". The gas sample must not contain any liquids or dust. It is recommended using a sufficiently dimensioned tube so that the sample remains with atmospheric pressure. The sample volume measured by the analyser is depending on the sample pressure.

A tube of Teflon $\frac{1}{4}$ " is recommended.

The pneumatic scheme corresponding to the ambient air sampling is:



With option internal calibration, the pneumatic scheme is:



c) Standard gas sampling (controlled by relay 7/valve 5 power board)

There can be 3 types of standard gas:

1. A calibration cylinder containing the BTEX with concentrations ranges similar to the concentration range of compounds contained in ambient air (ppb).
2. A calibration cylinder containing BTEX with much higher concentrations (ppm) than those contained in the ambient air. In this case, it will be necessary to make a dilution of this standard gas before its introduction into the analyser.
3. Permeation tubes of BTEX. The flow of dilution of air zero will be selected according to the permeation rate of the tubes. (Example: for a benzene tube having a permeation rate of 15 ng/min at 45°C, there will be a total dilution flow about of 200 to 300 ml/min).

1. Calibration with a cylinder containing BTEX < 100 ppb

If the sampling flow is around -15 ml/min, it will be enough to regulate the outlet standard gas at +30 ml/min.

On the reducing valve of the standard gas bottle, put a Teflon tube 1/8 ".

Inside this tube, put a stainless steel tube with a fixed restriction (for example a 1/16" SS tube crimped inside the tube Teflon with the ferrule 1/8 "swagelok). This tube 1/16 "is sufficiently crushed to have a flow of 30 ml/min with a supply pressure of 0.2 to 0.5 Bar.

Then connect the outlet of the bottle (Teflon tube) on the inlet standard gases 1/8" Swagelok situated on the rear face of the analyser (Don't forget to check the leaks). When the analyser is in sampling phase of standard gas, the analyser will take 15 ml/min. The remaining flow will go to the VENT.

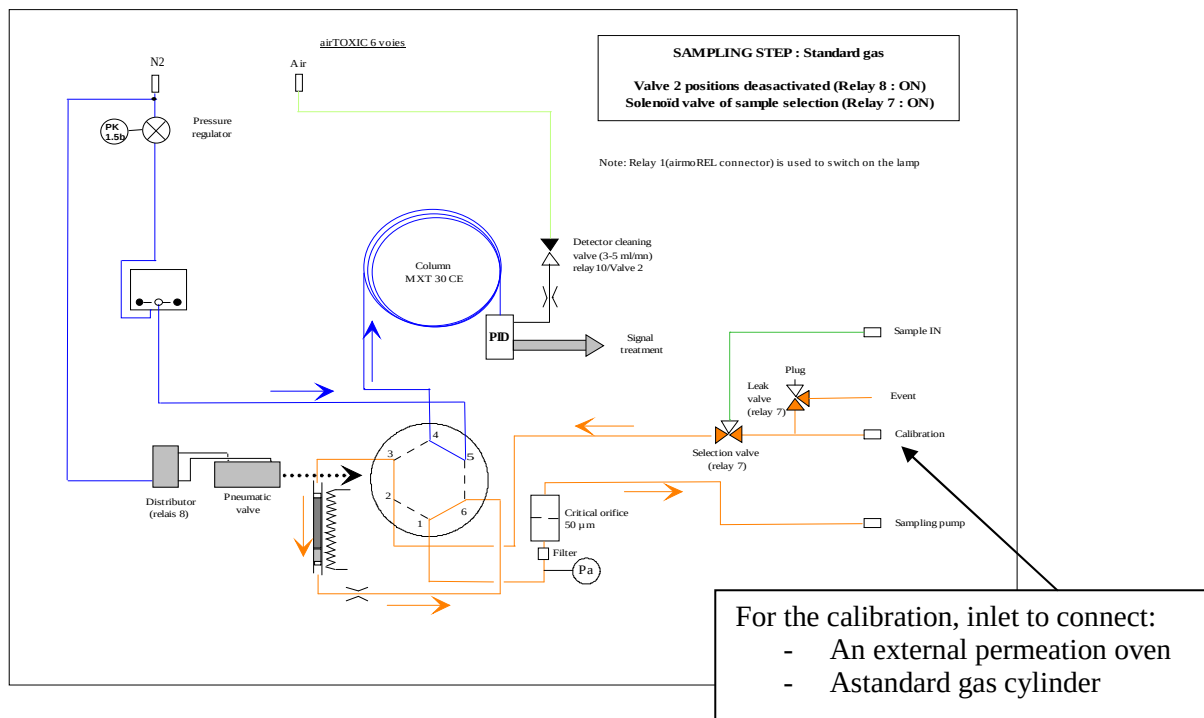
2. Calibration with a cylinder containing 100ppb<BTEX<1ppm or an external permeation oven

The sample must be introduced in the GC at atmospheric pressure. The standard gas has to be diluted (between 1/10 and 1/100).

Put a "T" at the instrument standard gas inlet: it permits the analyser to take the 15 ml/min necessary to atmospheric pressure and to send the remainder to a VENT.

The standard gas flow will be fixed by a restriction (the standard gas flow will be set at: 0.15 ml/min to 1.5 ml/min in function of the standard gas concentration). The dilution can be done with zero air or nitrogen. The dilution flow will be fixed around 30 ml/min. In this case, to prevent pollution of laboratory ambient air, the "VENT" of the external "T" will be connected to the VENT and the internal "VENT" tube of the analyser will be plugged.

The pneumatic scheme of sampling step of external standard gas (cylinder or external permeation oven) is:



3. Calibration with an internal permeation oven (with option internal calibration)

The permeation oven is placed inside the analyser. It's regulated at 45°C or 40°C and it contains a tube of Benzene with a permeation rate around 15 or 32 ng/min at 45°C or 40°C.

The analyser must be supplied with 3 Bar of zero air. In our office, we have adjusted the internal pressure regulator of the permeation oven to have a permanent air flow inside the permeation oven around 50 ml/min for an alimentation pressure around 0.2 to 0.4 Bar. When the standard gas selection solenoid valve is activated, the dilution solenoid valve is activated in the same time so that the zero air flow increases to 250 ml/min. This flow corresponds to the addition of a permanent air flow of 50 ml/min from the permeation oven and air flow 200 ml/min of the dilution.

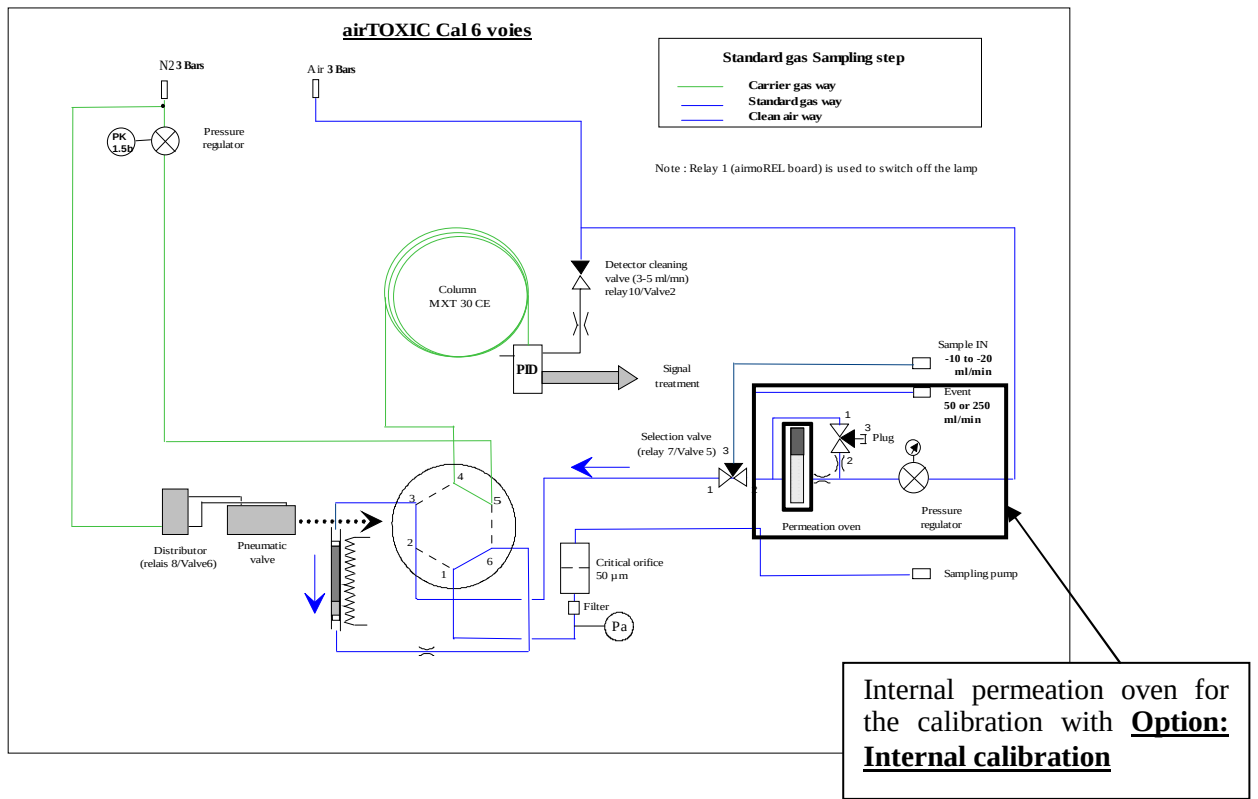
The approximated concentration of internal standard gas becomes:

$$\text{Conc Benzene} = \frac{15}{0.250} = 60.0 \text{ ng/l or } \mu\text{g/m}^3$$

The molecular weight of Benzene is: 78.11 g/mol
And the molecular volume at 20°C is 24.04 l.mol⁻¹

$$\text{Conc Benzene in ppb} = \frac{60 \times 24.04}{78.11} = 18.5 \text{ ppb}$$

With option internal calibration, the pneumatic scheme of sampling step of the internal standard gas is:



F. 3. 1. INJECTION OF THE SAMPLE IN THE ANALYTICAL COLUMN (TRAP AND DESORPTION)

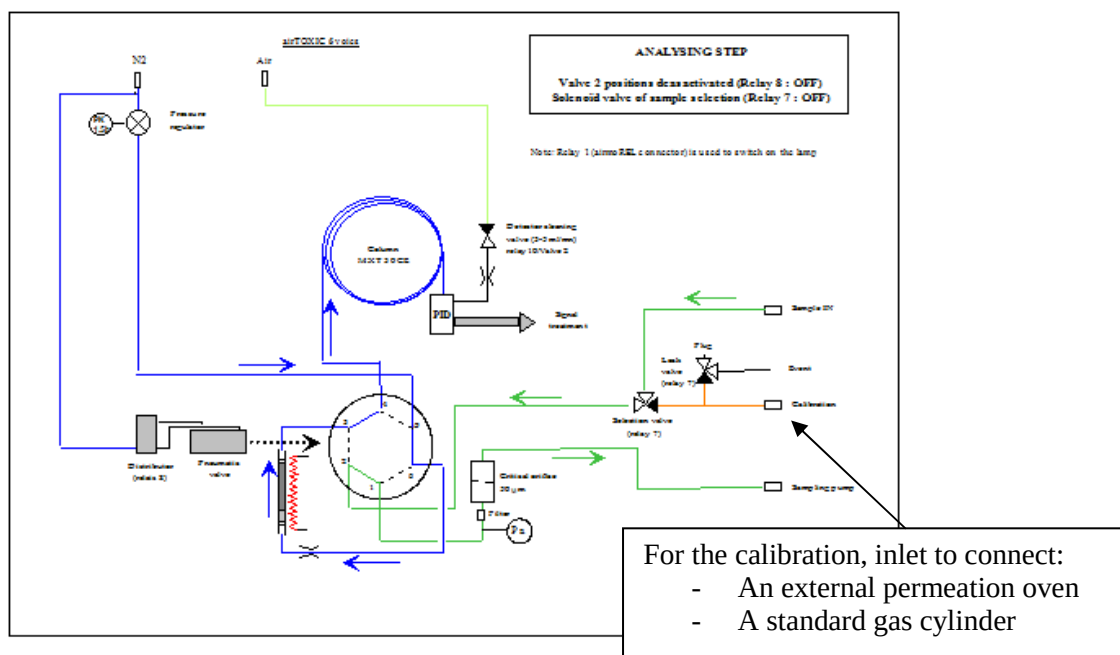
The pneumatic valve that was in "sampling" position gets in "injection" position; thereby the sampling tube is introduced in the carrier gas circuit. The circulation way of carrier gas inside the tube is in the way opposite to the sampling way. At this time, the trap is heated in order to desorb the VOC adsorbed. The time of thermo-desorption is a few minutes (depending on the cycle duration).

The analytical column is situated in an oven of which the temperature is programmed with a gradient that starts at 60 seconds after the beginning of the cycle during the trap thermo-desorption.

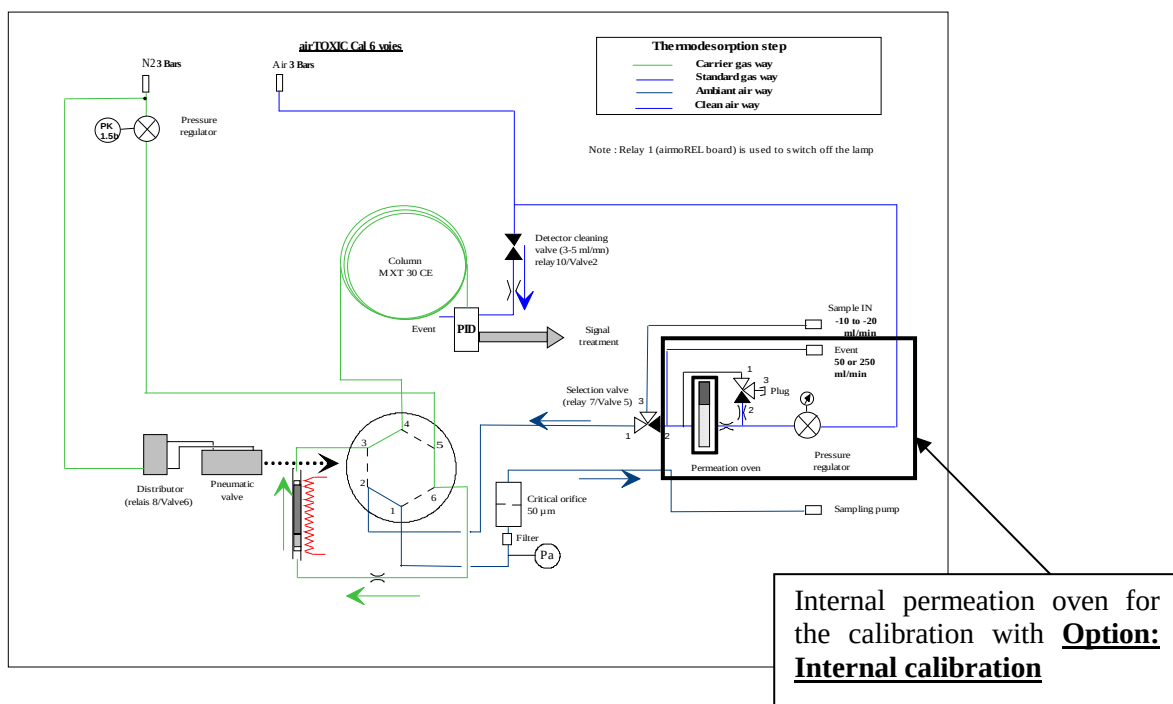
The gaseous sample is introduced in the analytical column by the carrier gas flow. Then, the compounds elute in the column at a characteristic rate (depending on their boiling point and on their interactions with the column stationary phase). Generally, the retention time of the compounds increases with their molecular weight (boiling point).

By default, the 2 positions valve is in position "injection".

The pneumatic scheme of injection step of sample is:



With option internal calibration, the pneumatic scheme of injection step of sample is:



F. 4. 1. DETECTION AND DATA TREATMENT

At the extremity of the column, a photo ionization detector (PID) generates an electrical signal proportional to the concentration of the sample components as they elute from the column. This electrical signal is digitised to be transferred to the CPU board where the microprocessor handles the data (integration, mass or concentration calculation, peak identification...). All parameters (data results, chromatograms, integration reports...) are then transferred via a RS-232 output where they can be displayed and reprocessed by the software. The digitised signal is also available as an analogue output (0-1V).

The data acquisition starts at 191s (cycle in 15 min) or 245s (cycle in 30 min) after the method start (depending of the cycle duration).

Caution: During this analysis, it is advised to not exit the ON-LINE menu because the data would be lost. But, it is possible to reduce the software window. The complete cycle (sampling, trapping of the compounds, injection, chromatographic analysis and detection) is repeated. The on-board microprocessor stores the data (chromatograms and trends), calculates the selected compound concentrations and stores them. The compounds identification is made on the basis of their retention times, and concentrations are calculated in reference to standard compound analyses.

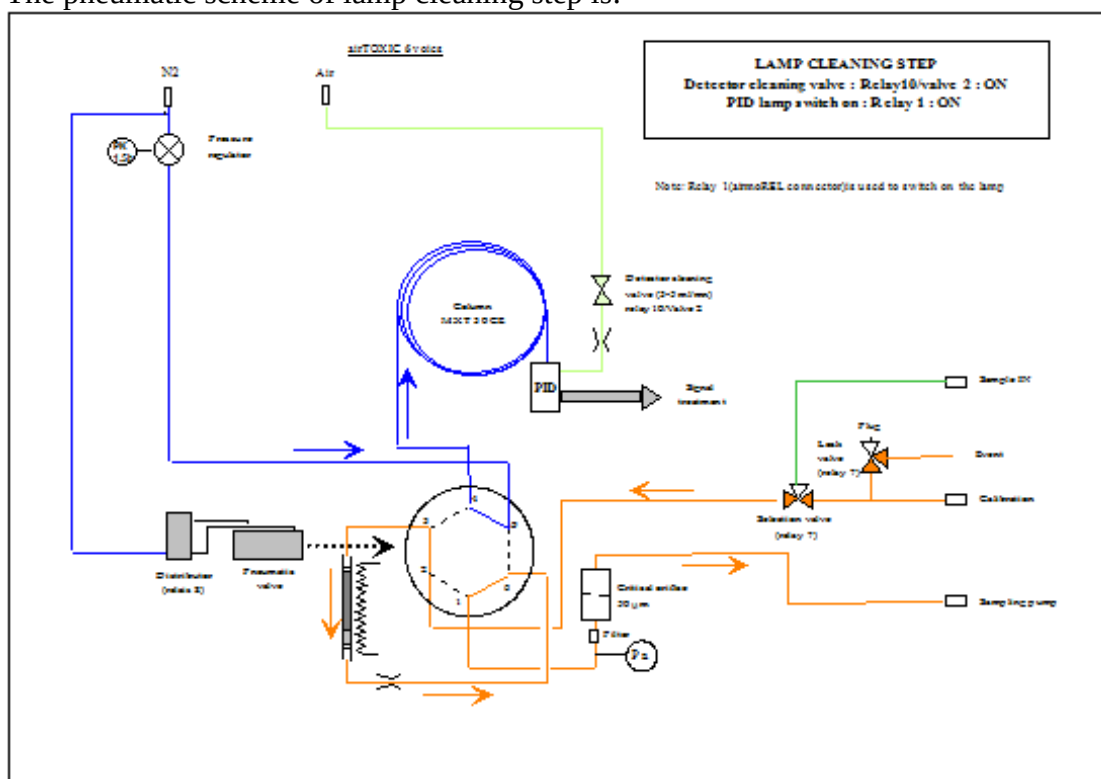
F. 5. 1. SELF CLEANING OF THE LAMP

Detector PID is not a destructive detector and the substances eluted from the analytical column are directly in contact with the lamp area. Thus, to avoid a VOC accumulation on the lamp area, which can cause “less sensitivity of the detector”, a solenoid valve controlled by the relay 10/ valve 2 (of the POWER board) activates the zero air/N₂ for cleaning the lamp area.

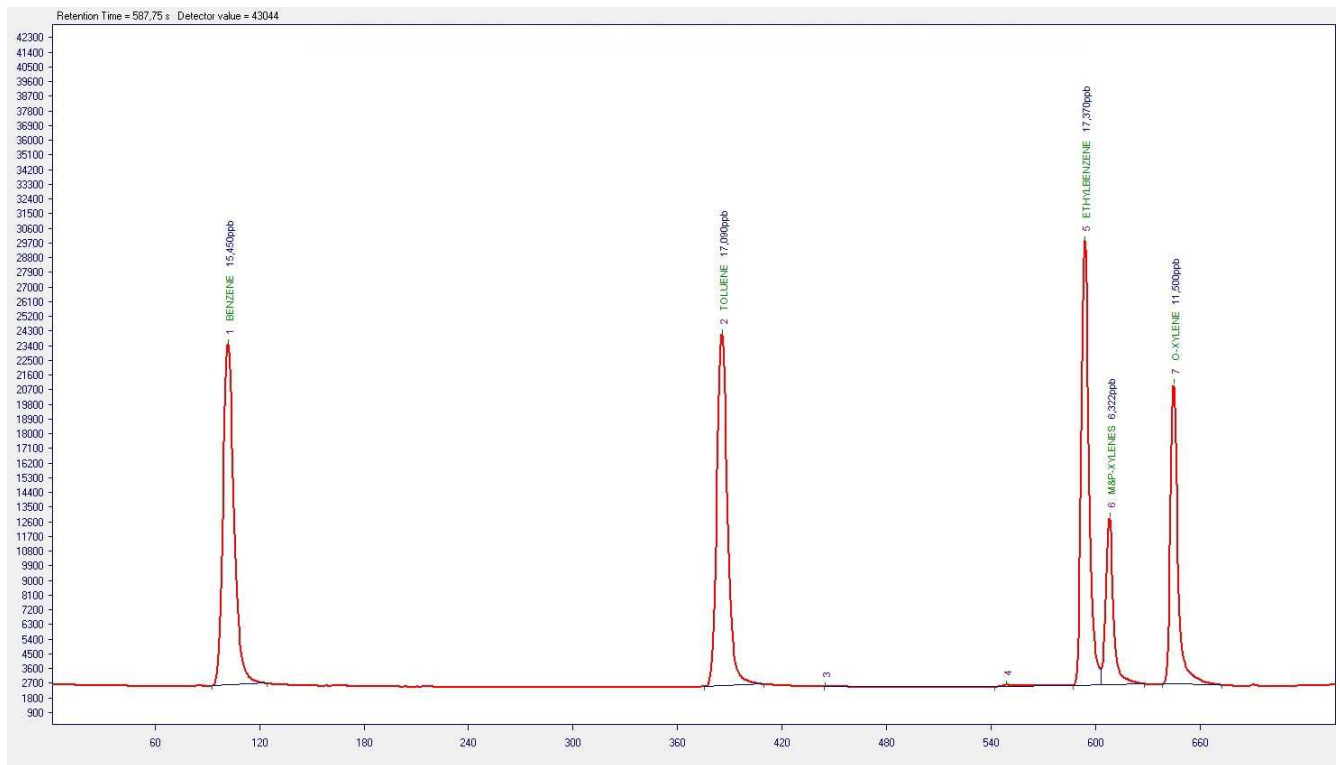
When this relay is active, a flow around 3 to 5 ml/min of zero air (or nitrogen) is sent to the lamp area.

This relay is activated by Vistachrom a few seconds after the end of acquisition. The lamp of the detector is still lit. Next the lamp turns off (by deactivation of the relay: RELAY 1 of the airmoREL board) and the air of cleaning continue to sweep the lamp area during practically all the duration of the cycle.

The pneumatic scheme of lamp cleaning step is:



F. 6. 1. CHROMATOGRAM EXAMPLE OF PERMEATION TUBES ANALYSIS CONTAINED INTO A PERMEATION OVEN



Operating conditions :

Description : External STD during 360 s
 Method Name : CALIB30M Substances Table Name : CAL-30MN
Sampling :
 Tube Number : 3 Duration : 360 s Volume : 102,201 ml Date :
Detector :
 Amplification : 2-Middle Sample Rate : 15 per second

Peak List

Substance	Result	Unit	Start (s)	R.Time (s)	Max	Stop (s)	Area	Type	FWMH
BENZENE	15.450	ppb	92.60	102.13	23626	124.53	154099.0	ST_E	6.53
TOLUENE	17.090	ppb	375.53	385.73	24227	409.60	152404.0	ST_E	6.27
ETHYLBENZENE	17.370	ppb	587.07	594.20	29941	603.33	141523.0	ST	4.53
M&P-XYLENES	6.322	ppb	603.33	608.33	12959	627.93	52839.3	E	3.93
O-XYLENE	11.496	ppb	638.60	645.20	21152	672.47	93145.7	ST_E	4.13

Filter

☒ Remove unidentified peaks ☐ Display all peaks

F. 2. PHOTOIONIZATION DETECTOR

F. 1. 1. INTRODUCTION AND SPECIFICATION

The photo ionization detector PID has been designed to detect organic and some inorganic species eluted from gas chromatography columns. The PID shows high sensitivity, wide linear range and simple operation.

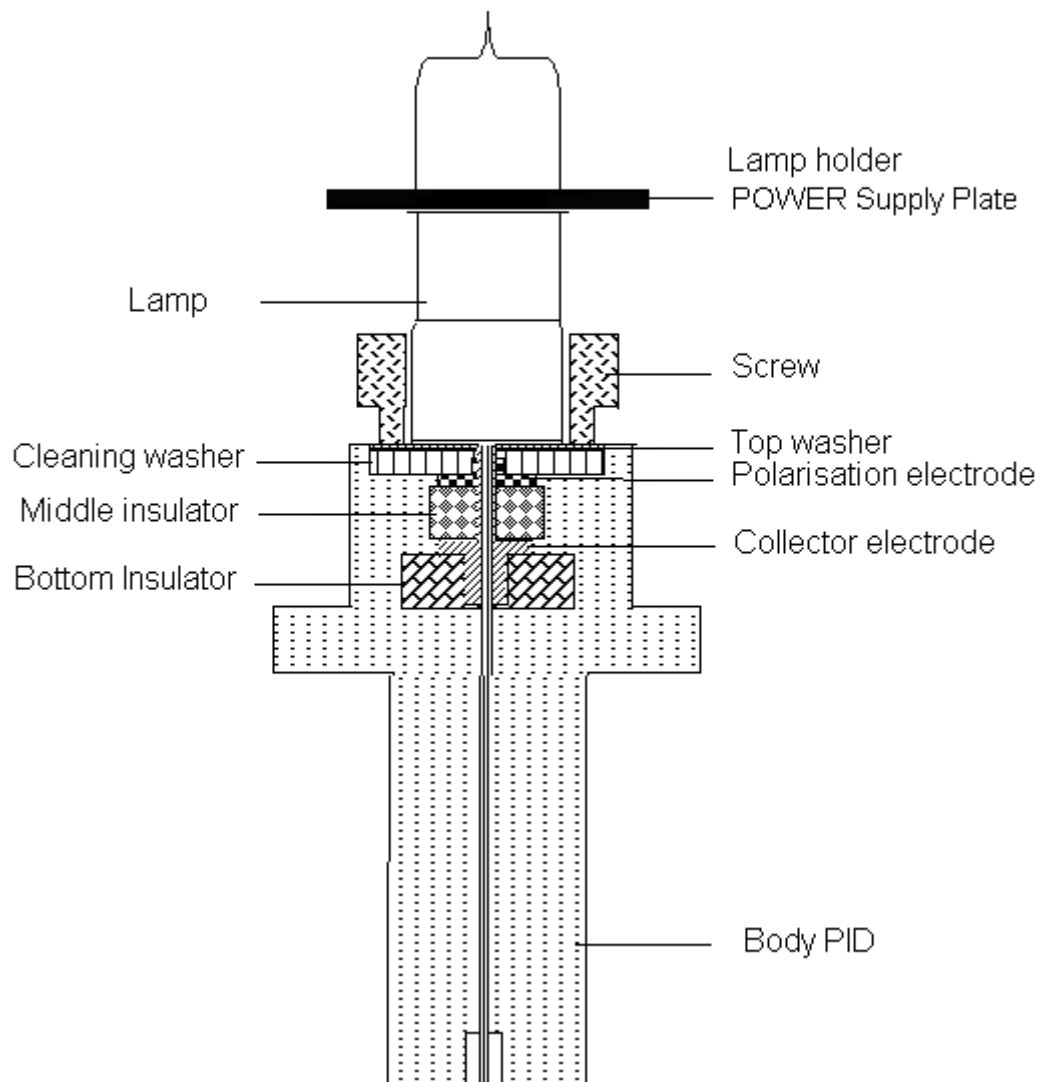
F. 2. 1. DESIGN AND OPERATION

THE PID operation is based on ionization of compounds by means of UV-radiation. Kr, Xe, or H₂ glow discharge lamps are used as the source of such radiation. The lamp emits the photons with characteristic energy levels. The photons go through an ionization chamber, where a part of photons is absorbed by the eluted species. The compounds whose ionization energy is less than photon energy are ionized. The ion current produced in ionization chamber is proportional to the concentration measured of compounds.

The PID assembly is shown in lamp scheme here after. It involved a body with gas inlet, ionization chamber and UV-lamp. Metal spacer is placed between the ionization chamber and the lamp. Lamp housing, spring and Teflon sleeve are used to keep the lamp against the spacer. Lamp housing is connected to detector body by means of lamp holder and power supply plate. The coaxial electrodes in the ionization chamber are separated from each other and metallic parts of the detector by means of ceramic insulators. One of the electrodes is connected to the PID power supply, another –to the electrometer. The electrical leads of UV-lamp are brought out through the hole in the top of housing and connected to the lamp power supply.

The power supply board provides a stable current of 0.2 mA for lamp ignition and operating and a polarizing voltage of 9 V for PID.

F. 3. 1. LAMP SCHEME



G. DETECTOR INSTALLATION

G. 1. PRECAUTIONS

The voltage on the lamp power supply board and on the lamp electrodes reaches -780 VCC.

To assemble or disassemble the detector, turn power off the instrument with the two positions switch placed inside the analyser.

Don't use the main switch on the rear face if the PC is on.

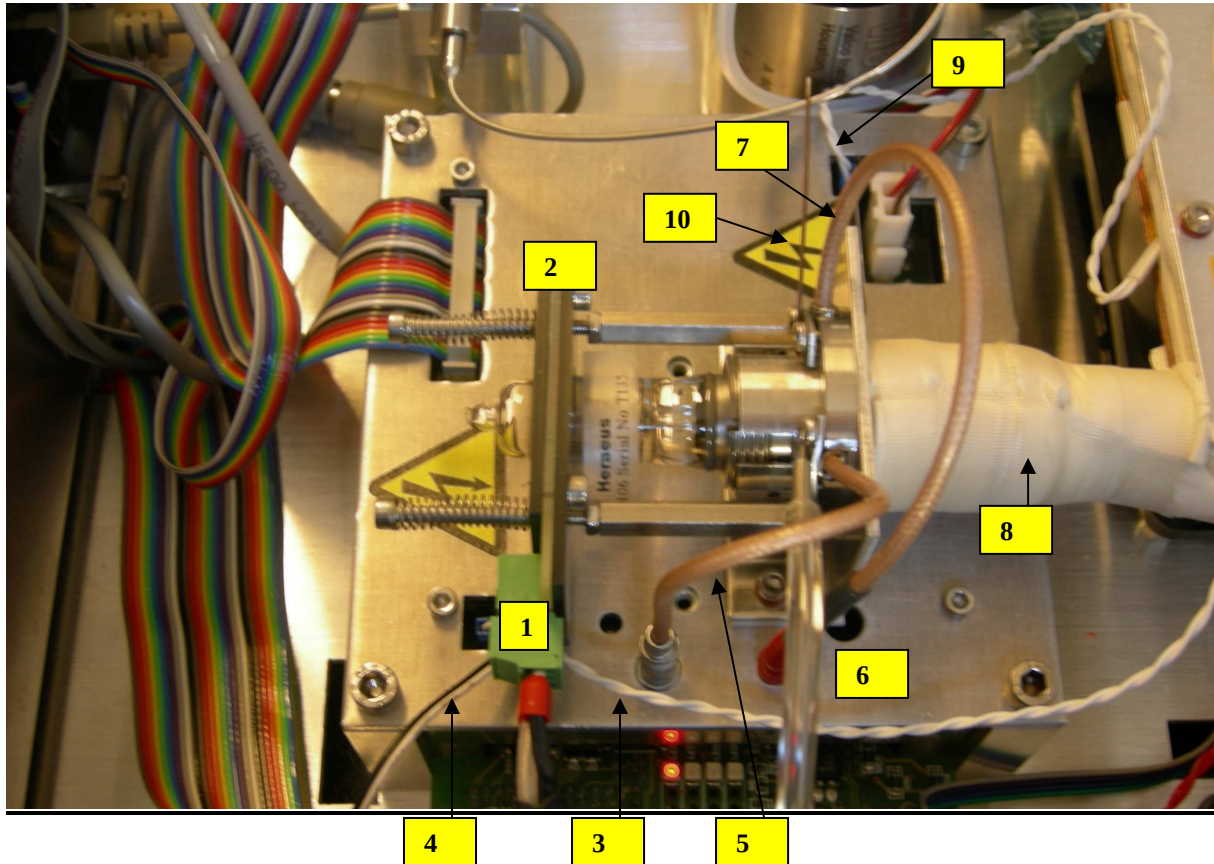
No contact can be tolerated between any element of lamp power supply board and metal parts of chromatograph. Be careful when installing of the board inside the device.

G. 2. DETECTOR MOUNTING

The PID body is mounted on a metallic support fixed with screws. It is heated by a heating resistor. VUV-lamp in housing is located on the detector body with bay-net joint. The lamp current is adjusted near 200 μ A in our laboratories.

CAUTION: Do not slacken the springs which compress the lamp abruptly because the lamp window could be destroyed.

G. 3. DETECTOR CONNECTING



1) High voltage cable

This cable supplies the tube with high voltage around -780V. This voltage can be set on the High Voltage housing.

2) Lamp holder – Power supply plate

Never remove this holder when power on. Before to remove the lamp, switch off the instrument.

3) PID sensor cable

4) Analog output cable

5) Electrode signal

It is connected to the electrode in the detector. The current which goes through this cable is very low (some μV) and it is amplified by the electrometer board.

6) Air cleaning tube

This tube brings 3 to 5 ml/mn of zero air comes to the lamp window to clean it during cycle.

7) Polarisation

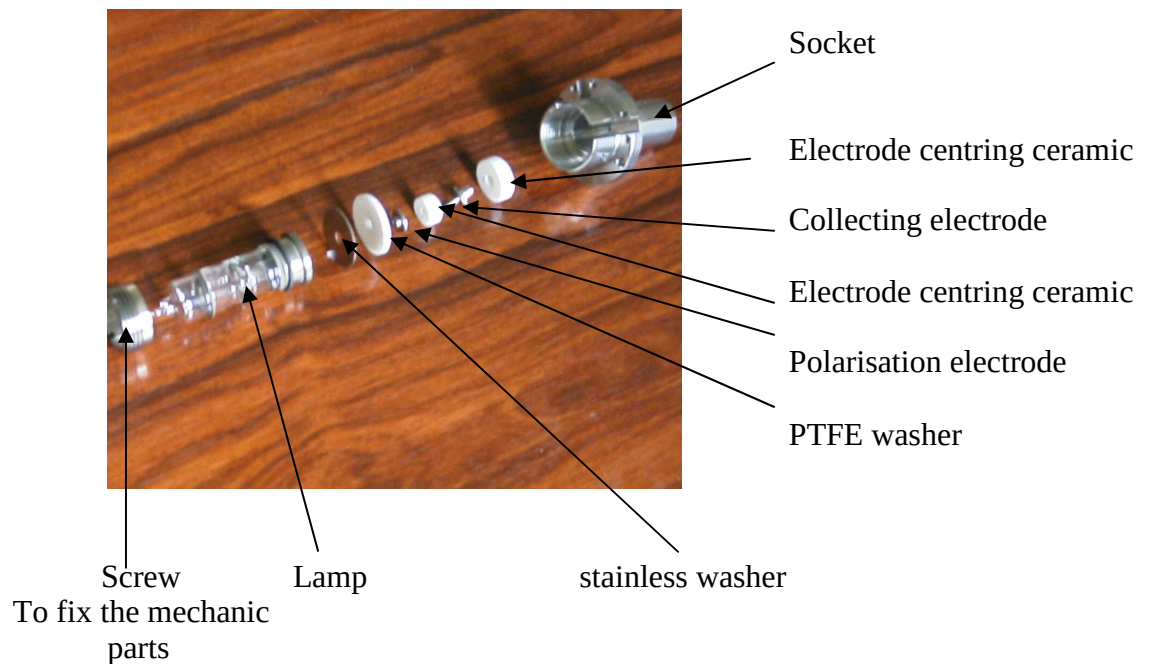
This electrode polarises the detector with voltage of 9,3V. This voltage comes from the High voltage housing and it cannot be adjusted.

8) Insulated Socket of the detector. Its function is to heat the detector at 150°C. Its resistor is around 10 Ω and it is supplied by the Power Board Pwm signal.

9) Oven sensor cable

10) VENT of the cleaning zero air (or Nitrogen) when the Valve 2 of POWER Board is active.

Detector assembly



G. 4. DETECTOR SWITCHING

By default, the PID lamp is switched off. Lighting is programmed in the working method of the analyser. The duration varies according to the duration of the selected cycle (15 or 30 minutes).

The detector lamp ignition is controlled by the relay "RELAY 1" of the airmoREL Board. When the lamp is lit, a purple blue light appears inside the lamp.

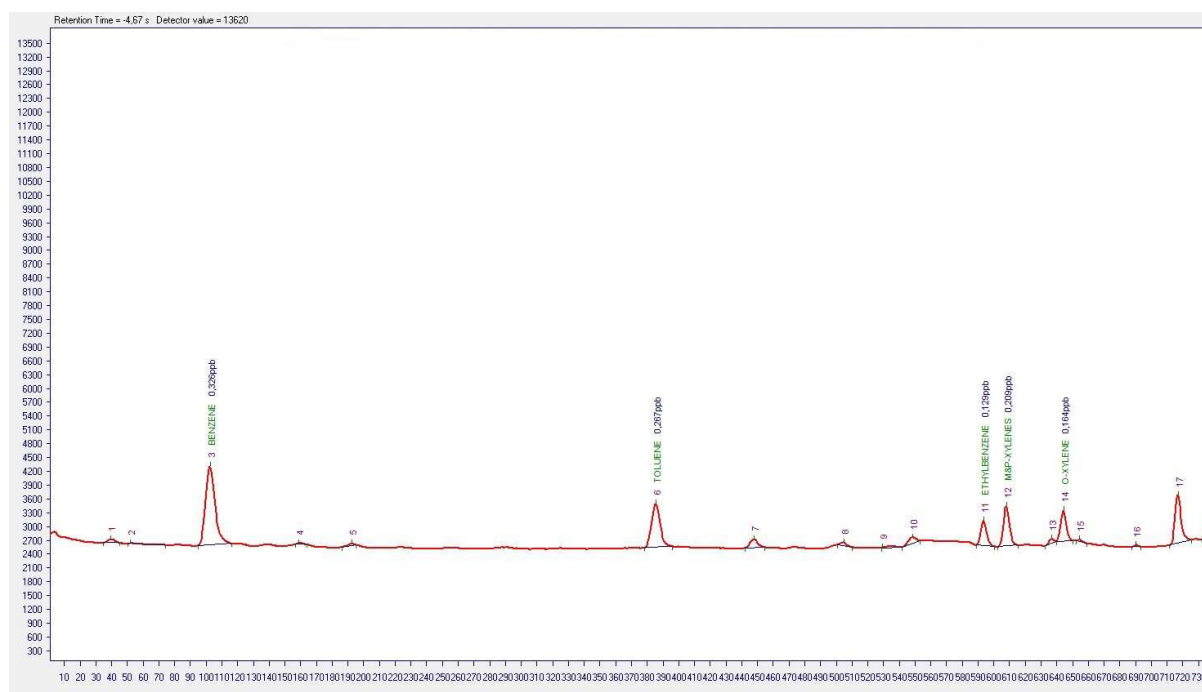
H. CHROMATOGRAM EXAMPLE

1. Ambient air analysis

Analytical conditions:

- Cycle duration: 30 minutes
- Trapping at ambient temperature during 22.5 minutes
- Trap desorption: duration 240 seconds
- Carrier gas: Nitrogen 5.5 at 3 to 4 ml/min. Head column pressure 1.00 (+/-0.15) Bar.
- Oven temperature: 36 to 38°C at 2 °C/min- 38°C to 50°C at 2°C/min - 50 to 80°C at 10°C/min- 80°C to 190°C at 15°C/min – isothermal 190°C (hold 240s)
- Acquisition duration: 740 seconds.

➤ Sample : 382.3 ml of ambient air



Operating conditions :

Description : Ambient air 22.5 mins
 Method Name : BTX-30MN
 Substances Table Name : BTX-30MN
Sampling :
 Tube Number : 3
 Duration : 1350 s
 Volume : 382.296 ml
 Date :
Detector :
 Amplification : 2-Middle
 Sample Rate : 15 per second

Peak List

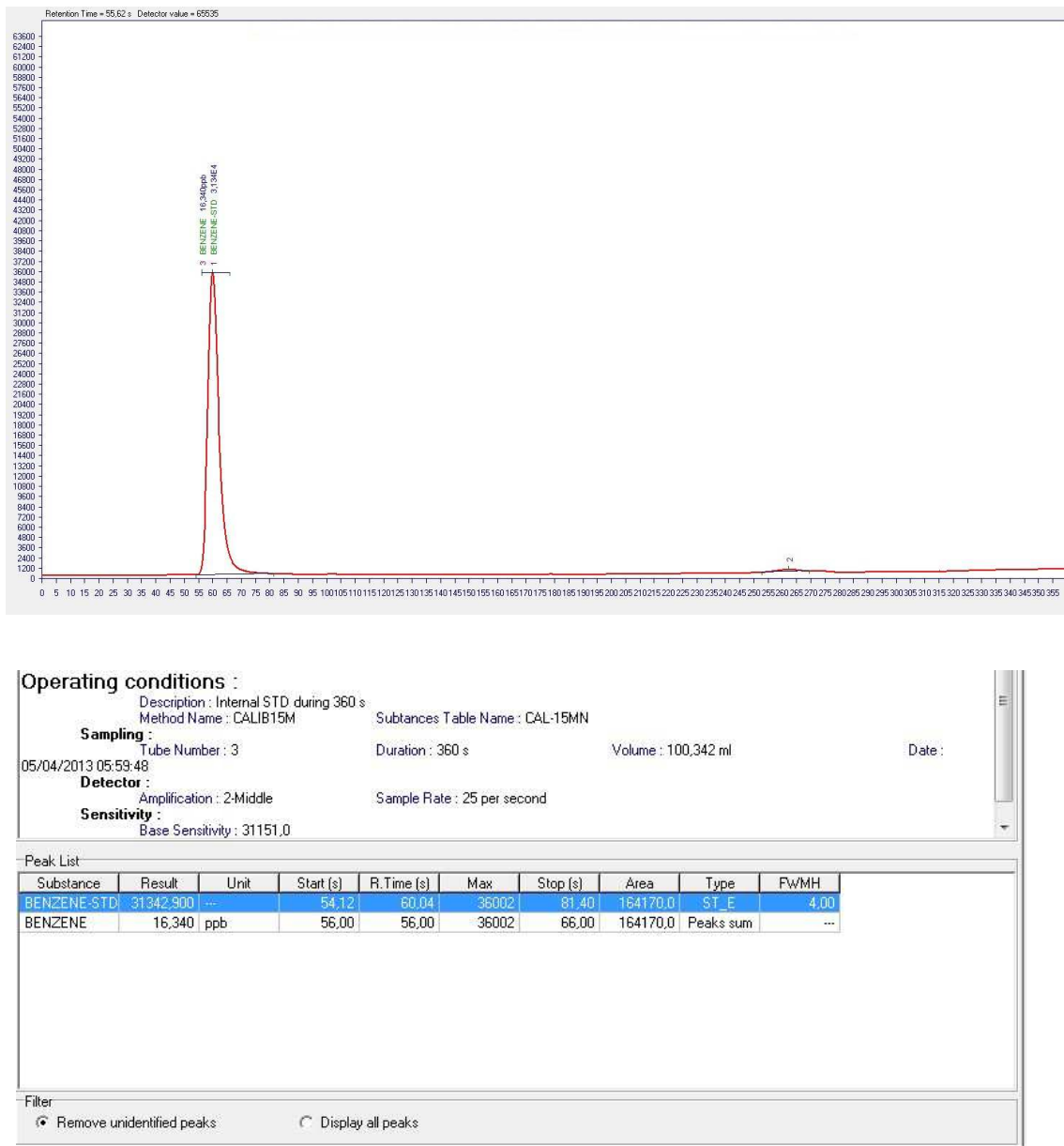
Substance	Result	Unit	Start (s)	R. Time (s)	Max	Stop (s)	Area	Type	FwMH
BENZENE	0.326	ppb	94.73	102.67	4341	116.13	12066.5	ST_E	6.33
TOLUENE	0.267	ppb	378.33	385.73	3522	395.80	5994.3	ST_E	5.87
ETHYLBENZENE	0.129	ppb	589.13	593.80	3161	600.33	2400.0	ST_E	3.87
M&P-XYLENES	0.209	ppb	602.73	608.20	3470	615.40	3964.1	ST_E	4.20
O-XYLENE	0.164	ppb	639.60	644.53	3381	650.47	2814.0	ST_E	3.80

Filter

☒ Remove unidentified peaks ☐ Display all peaks

2. Standard gas analysis

Sample: Benzene (internal standard gas)



Sample used: internal permeation oven containing a benzene tube.

The permeation oven temperature setting is: 45 °C.

The total dilution flow is around 180 ml/min to 250 ml/min (depending of the analyser configuration).

Permeation rate of the tube around: 15 ng/min at 45°C (+/- 10 %).

The concentration awaited is between:

$$\frac{15}{0.250} = 60.0 \mu\text{g}/\text{m}^3$$

and

$$\frac{15}{0.180} = 83.3 \mu\text{g}/\text{m}^3$$

I. INSTALLING THE AIRTOXIC

I. 1. RECEIPT OF ANALYSER AND CHECK

Each analyser is inspected and packaged prior to transport with great attention. Immediately after receipt, we recommend to perform a quick visual inspection of the package. If the package is damaged, report it in writing to the carrier at the time of delivery.

The AIRTOXIC A73022 is packed in a wood box with protection and maintaining foams placed above and below the analyser.

The AIRTOXIC A73022 packaging extraction begins with the opening of the wood box; at this stage, it is possible to verify the visual integrity of the analyser.

Any damages must be immediately identified and photographed; it should be reported to the carrier as well as to your local Distributor or to CHROMATOTEC.

For major damages, the AIRTOXIC A73022 shall be returned to the manufacturer after synchronization with the service department, which can be reached by e-mail at: support@chromatotec.com.

In case of non-respect of this procedure, CHROMATOTEC cannot be kept in charge of the caused damage and cost will be charged to the customer.

I. 2. ELECTRICAL SUPPLY

This instrument is supplied with 115VAC or 220 VAC.

The supply must be able to deliver the following power:

115 VAC or 220 VAC (+/- 10 %)

Power: 400W

Fuse: 15A

Power uptake:

- Standby: approximately 80 W
- Normal operation: approximately 140 W
- Short duration peak: approximately 360 W.

These values are for guidance only. The actual power uptake varies with the maximum oven temperature, PID temperature and calibration plug-in unit.

I. 3. GAS SUPPLY AND CONNECTIONS

See the rear panel scheme to visualize the pneumatic connections of the instrument.

I. 1. 1. WARNING

The gas supply tubing diameters must be sufficiently large so that the required inlet pressure at the instrument is maintained even under worst-case conditions (such as maximum gas flow rate at maximum ambient air).

All tubing used must be clean, debarred, and free of sward and dust. The use of virgin tubing is recommended. Tubing which has previously been in contact with liquids is not suitable. The following materials have proven themselves suitable:

- Nitrogen: stainless steel, **1/8"**, HPLC grade.
- Zero air: stainless steel, **1/8"**, HPLC grade.
- Sample inlet: glass, 10 mm, or PFA, **1/4"**.
- Standard gas inlet: glass, 10mm, or PFA, **1/4"**.
- Standard gas outlet: **1/8"**(grade not important). **To connect on A VENT.**
- Pump: **1/4"**(grade not important).

Before pressurising the tubing for the first time, all connections must be checked for correctness of assembly and leak tightness.

For a better stability of gas flows, it is recommended that double pressure release valves are used with gas bottles. These pressure regulators must be free of plastic (i.e. GC or ultra-high purity gas quality).

All gas supplies are controlled on the airTOXIC. The use of unsuitable pressure-reducing valves would result in the entry of contaminating hydrocarbons into the measuring system, resulting in incorrect measurement values.

See on § I-6 Gas and power supply connectors on the instrument rear panel.

The following information refers to the values measured at the inlet connectors to the airTOXIC.

I. 2. 1. NITROGEN

Nitrogen is used as carrier gas and for the pneumatic actuator. It can also be used for the cleaning of the lamp area and for the internal or external permeation oven when there is no zero air available.

- Nitrogen (5.5 quality recommended).
- Inlet pressure: **3 bars**
- Consumption for carrier gas: **3 to 4 ml/min**
- Consumption for the air actuator: **near 2.6 liters by day** (depending of the cycle duration).
- Connector: **1/8"**, stainless steel, swagelok.

I. 3. 1. AIR

Zero air is used for the clean air of PID lamp and for the internal or external permeation oven.

- Air (Zero).
- Inlet pressure: **3 bar**
- Consumption for the self cleaning of the PID Lamp: **3 to 5 ml/min**

- Consumption for the permeation oven: **50 ml/min (250 ml/min when relay 7 is activated).**
- Connector: **1/8"**, stainless steel, Swagelok.

I. 4. 1. SAMPLE

a) Sampling system

An adequate vacuum supply is required to aspirate the sample into the instrument and for the sample volume measurement.

- Vacuum: **800 hPa** (200 hPa maximum at the vacuum outlet).
- Pump flow: **1 to 2 l/min.**
- Connector: **1/4"**, stainless steel, Swagelok.

The gas sample must be made available at the instrument inlet ("Sample", 1/4" stainless steel, Swagelok) under some defined conditions. It must not contain any liquids.

It is recommended that the sample be brought to the instrument through enough high dimensioned glass tubing. Metal tubing should be kept as short as possible.

In order to carry out the sample volume measurement, some conditions must be fulfilled. The lower the inlet pressure the less the sample gas flows is into the instrument. The pressure at the inlet connector must be at least 800 hPa.

b) Sample

The sample gas must not contain liquids or particles.

If gas at high temperature and of high relative humidity is being sampled, condensation may occur in the instrument. This must be prevented by diluting the sample with dry gas.

In option, if there is a particle pollution of the atmosphere, filters can be used. The choice of the filter is done according to the level of pollution of ambient environment. If there is lot of dust, you can use a 2 µm filter. If there is not too much dust, you can use a 5 µm filter.

If the ambient air is clean, it is not necessary to use filters to avoid risks of catching compounds into filters. The size of particles is not a problem for the column if some reach to go through.

A filter on the sample must not cause a pressure drop by more than 50 hPa.

The filter must be frequently changed, since the slightest accumulation of dust can lead to the absorption of certain components in the sample.

All methods of sample filtering have some effect on the measurement. It is essential in all cases to check that the compound to be analysed actually goes through the filter. (This can be done by making test measurement with reference samples before and after the filter and comparing the results).

Note: the dust must be removed by using a suitable fine glass wool or glass frit filter in the sample pass.

- The flow is fixed by a critical orifice of 50 µm. The sampling flow is around **10 to 25 ml/min.**

c) Standard Gas (Internal or external calibration device)

An external (permeation oven or gas cylinder) or internal calibration device is used to do the “Autocalibration” of the analyser, that is to calculate and adjust the sensitivity of the analyser and so to validate the results.

Internal permeation oven:

The temperature setting of the permeation oven is: **45°C** or **40°C**.

For example, the permeation tube included: **15 ng/min à 45°C or 40°C (certified +/- 10%)**. The permanent air dilution flow is $\approx$ **50 ml/min** (when the relay 7 / valve 5 is off)
 $\approx$ **250 ml/min** (when the relay 7/valve 5 is on)

The solenoid valve controlled by the relay 7/valve 5 is activated 120 second before the sampling start to be sure the total air flow for dilution is stabilized.

An EVENT on the rear face permits to measure the permeation flow.

- Connector: **1/8"**, stainless steel, Swagelok.

External calibration:

In the case where the calibration gas would be diluted before its introduction into the analyser, it is necessary to use a “T” at the instrument inlet to have a correct pressure measurement (when the standard gas used is too much concentrated and has to be diluted).

- Inlet Connector : 1/8'' swagelok stainless steel
- Sampling flow is fixed by the critical orifice of 50 μ m.
- Outlet external standard gas : **1/16'' OD tube**, stainless steel

The instrument measure the sample volume introduced in the analyser with the PA Board. This volume depends on the critical orifice pressure. This pressure will be always near ambient pressure. The analyser takes the needed volume and **the additional internal standard gas output is sent towards the VENT.**

I. 4. SIGNAL AND DATA CABLING

Data cable:	RS 232, 9600 Baud. Maximum permissible cable length: 15 meters Connector 9 pole submin. Type D, male / female. Inside the instrument.
Analogue output:	0-1 V, 500 ohms output impedance Two 4 mm diameter banana plug sockets (black: -; red: +). Short circuits protection.
Switching output:	Isolated relay switch controlled by CPU microprocessor. Switching capacity 100 mA at 24 V Two 4 mm diameter banana plug.

I. 5. MECHANICAL INSTALLATION AND OPERATION POSITION

The usual lack of space in instrumentation cabins, vehicles and measurement stations results necessary in the installation of the various measuring systems in close proximity to each other. Despite this, it is essential to ensure that a sufficient supply of cooling air is available to the instrument at all times. Usually, cooler conditions are found in the lower levels of large systems. Under no circumstances should an instrument with large power consumption be placed directly below the AIRTOXIC.

I. 6. ENVIRONMENTAL CONDITIONS

The permitted ambient temperature range for operation of the instrument is **+18°C to +24°C**.

Do not forget that the internal temperature of the instrument is 5 to 8 °C higher than ambient. Therefore the lowest permissible oven temperature lies about 5 °C above ambient, an important point when operating at elevated room temperature, expect extended cooling times.

J. TOUCH PAD USING

No finger pressure is required. To move the cursor you simply move your finger across the touchpad. Tap once on the pad to “click” twice to “double-click”, and tap and hold to drag, and highlight.

When the user’s finger encounters the edge of the pad during a drag, draw, or highlight operation, the user may lift and reposition their finger (similar to repositioning a mouse on a mousepad). Thus, the user is always in control and is never required to “steer” as the cursor begins to coast in the direction of the finger.

The overlay incorporates two distinct levels of texturing. This dual textured surface is used to define the areas on the touchpad where the GlideExtend and Right Taps features may be activated during typical user operations (see figure 1). The GlideExtend region provides valuable tactile feedback during drag, draw, and highlight operations, signalling to the user they may now lift and reposition their finger away from the edge of the touchpad while GlideExtend is engaged. Similarly, the coarser texture of the Right Taps area alerts the user that tapping in this area will result in a secondary button input (right “click”). The Right Taps area is also visually delineated by a change in color.

Figure 1:



K. STARTING THE AIRTOXIC

Before turning on the supply gas (Nitrogen), you must verify that the pressure reducing valve is turned off because the pressure regulator inside the instrument is pre-adjusted and a big pressure variation is very dangerous for the pre-adjustments.

Check that all the tubes are connected correctly and gas tight.

- a) Set the Nitrogen pressure at **3 bar**. Switch on the sample vacuum pump. Connect to the VENT the outlet of the sampling pump and the outlet of the Standard T.
- b) Switch on the Main Power Supply (Back Face)
- c) When the airTOXIC is on the green LED "**OK**" and the red LED "**STAND BY**" light. It is possible that errors occurred before the instrument was last switched off; in this case, the error information will have been saved by the system. If this is case, the yellow LED "**WARNING**" or the red LED "**ERROR**" will light immediately after the instrument is switched on again. The error number will be sent to the computer before or by latest the end of the first chromatogram. When the airTOXIC is switch on, the initial parameters are charged in the instrument. These parameters are :
 - Column oven temperature: **36°C** (30 minutes cycle) / **43 °C** (15 minutes cycle)
 - PID temperature: **150 °C**
 - Head column pressure: $\approx 1,0$ (+/-0,15) Bar

These parameters are fixed and should not be modified.

- d) In the same time, the PC is switched on. Windows "embedded" starts with **Chromatotec** user "pass word": **CETOMRIA** or **Administrator** user "pass word": **1234** and the PC open automatically the Vistachrom software. You select the "**super user**" level and you type **1234** as Password.
- e) You log on the instrument with and the PC .
- f) Load the working sequence with .
- g) Start the analysis with the touchpad . The first cycle permits to initialize the system and to start a sampling step.

To change the hour in Windows XP embedded of the PC, see the procedure: (reference: **SMO 0012-00 Clock Adjustement in Embedded Computer.pdf**)

L. STOP THE AIRTOXIC

In any case, before **SHUT DOWN** the power supply with the main SWITCH on the rear panel. It will be necessary to correctly stop the instrument at the end of the method, wait some minutes until the LEDS "stand by" and "ok" are lit, and stop correctly the internal PC.

L. 1. CLASSICAL STOP

- Click on the icon . In this case, the analyser stops at the end of the analysing method. Wait some minutes until the LEDS "stand by" and "ok" of the RS 232 board light before close Vistachrom software.
- In any case, the LEDS "stand by" and "ok" of the RS 232 board must be lit and any other.
- When the oven temperature is near 36°C or 43°C, LOG OFF the instrument with the icon .

BE CAREFUL, if the icon is yellow , the instrument is in function and doesn't be shut down. When the icon is blue , the instrument can be switch off.

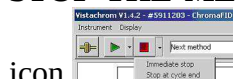
- When the instrument is LOG OFF and in stand by position (the LEDS "stand by" and "ok" of the RS 232 board must be lit), no communication subsists with the software and the instrument can be switched off with the internal POWER SUPPLY.
- You will have stopped the software before SHUTTING DOWN the GC and PC.

L. 2. EMERGENCY STOP

Sometimes, an error occurs caused by the system or by a human manipulation during communication between the instrument and the PC. It is possible to completely loose or not the communication with the instrument. In any case, the alone response will be to make a RESET of the instrument and of the PC. Two possibilities:

L. 1. 1. SOFTWARE RESET

- STOP THE MEASURE** at the end of the method on the ON LINE window with the



- Wait some minutes to obtain the initial parameters of the oven (36°C or 43°C), **sampling off, Desorption of the TRAP**, etc.
- LOG OFF** the instrument with the icon .
- CLOSE** the acquisition software **Vistachrom**.

- **START THE “ServiceGC” Software.**
- **Select the serial number of your instrument and the communication port.**
- **Click on the “LOG ON” button.**
- Click on “**RESET**” button (*Service GC*) the leds "**Stand By**", "**Error**" and "**Ok**" on the RS232 Board must be lit.
- When the “**dialog activity**” icon blink, the instrument communicates with the PC and the user can transfer the Setup with the “**Transfert setup**” button. The led "**Error**" will be lit off.
- **Stop** the “*ServiceGC*” utility with the “**Close**” button.
- Restart **acquisition software Vistachrom** and **LOG ON** with .
- Load the working sequence with  and restart the analyser with .

Sometimes, software RESET is not sufficient and hardware RESET will be necessary.

L. 2. 1. HARDWARE RESET

- Stop the measure with . Wait some minutes to obtain the initial parameters of the oven (**36°C or 43°C**), **sampling off**, **Desorption of the TRAP**. If the communication is impossible with the acquisition software, (use Service GC utility to STOP analyse).
- **SHUT DOWN** only the instrument. For this manipulation, you have to open the cover and use the 2 positions switch inside the instrument and disconnect the battery on the CPU Board.

CAUTION: UNDER THE COVER THERE IS A HIGH VOLTAGE POWER. TAKE GUARD WITH VARIOUS ELECTRIC CONNECTIONS.

- **Wait some minutes** to clean all the memory of the CPU board. **During this manipulation, it will be recommended to restart the PC.**
- **Reconnect** the battery on the CPU board.
- **SWITCH ON** the instrument with the internal two positions switch. The leds "**Stand By**", "**Error**" and "**Ok**" on the RS232 Board must be lit.
- **START** the “*ServiceGC*” Software.
- **Select the serial number of your instrument and the communication port.**
- **Click on “LOG ON” button.**
- The **Transfert setup** is automatic and the led "**Error**" will be lit off.
- **Stop** the “*ServiceGC*” utility with the “**Close**” button and **Restart** the acquisition software **Vistachrom**.
- **LOG ON** the instrument with  and Load the working sequence with the icon 
and start the measure with the icon .

In any case, the first cycle only permits to initialise the instrument. It will have no TRAP desorption, no acquisition during this cycle, etc.

M. AUTOMATIC CALIBRATION

M. 1. GENERAL

What is the Auto-calibration: It is the action of the analyser to adjust automatically the base sensitivity factor from known and stable reference gas measurements.

This option is possible if you have inside the analyser:

- An integrated oven containing one permeation tube (reference)
- Or a solenoid valve permitting to make a standard gas selection, with a standard gas cylinder or an external permeation oven connected on Inlet standard gas.
- Vistachrom software version 1.43 (minimum) to 1.47
- Microprocessor 5.8 (minimum) to 6.2 on the instrument CPU board.

This option permits to validate in continuous the ambient BTEX measurements because the standard gas analysis is automatically repeated like indicated in the working sequence.

M. 2. BASE SENSITIVITY

With an airTOXIC, the base sensitivity is:

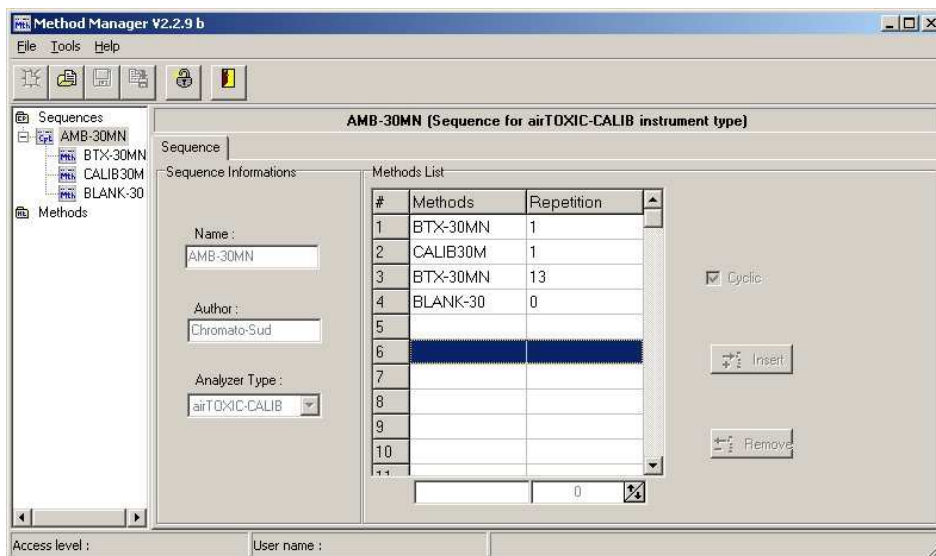
$\text{Base Sensitivity} = \frac{\text{reference compound PeakArea}}{\text{reference compound weight}}$

The instrument is calibrated in our office and a configuration and control quality report is edited and included in the user manual's folder.

The airTOXIC uses a PA board (to have an atmospheric pressure measurement) and a critical orifice (to control the sample flow). The real volume sampled through the TRAP is calculated by Vistachrom.

Be careful, the sample volume measured by the analyser is in ml. This unit cannot be modified by the user.

M. 3. EXAMPLE OF WORKING SEQUENCE WITH AUTOCALIBRATION USING



This routine working sequence is cyclic.

Each working method has a total duration of 30 minutes. Each analysis method gives a chromatogram.

So we have $24 \times 2 = 48$ chromatograms by 24 hours.

To have a shift date all 24 hours, we have introduced in this sequence 1 ambient air measurement, 1 internal standard gas measurement and 13 ambient air analyses. In this case, the standard gas analyses are executed each 7.5 hours. The “BS” of the analyser is calculated and **updated each 7.5 hours (if the auto-cal function is activated)**.

But we can also manage different cases. For example, only 2 standard gas analyses per day, which corresponds into the sequence: 1 ambient air measurement, 1 internal standard gas measurement and 22 ambient air analysis.

M. 4. WORKING METHODS

The VOC contained in the ambient air are measured during the analysis method named **BTX-30MN.mth**.

The reference compound(s) is (are) measured during the analysis method named **CALIB30M.mth**.

Many parameters are similar between the ambient air and the standard gas measurement methods.

The differences are:

- A specific substances table for each method
- A relay control for the standard gas selection (activation of the calibration)

M. 5. SUBSTANCES TABLE EXAMPLE

The substances table enables the VC software to do the identification of peaks according to the retention time of compounds. With precise analytic conditions (head column pressure, oven gradient...), the retention time is characteristic for each compound.

M. 1. 1. AMBIENT AIR SUBSTANCES TABLE

Edit substances table

Substances table information

Substances table name: BTX-30MN Author: Chromato-Sud

For the analyzer serial number: #25360611 Analyzer type: airTOXIC-CALIB

#	Name	RT Min	RT Max	Select Peak	GC Result formula	With X=
1	BENZENE	131	141	Middle	X	Area/BS
2	TOLUENE	251	261	Middle	$1.6 * X^{0.88}$	Area/BS
3	ETHYLBENZENE	360	370	Middle	$2 * X^{0.88}$	Area/BS
4	M&PXYLENES	370	380	Middle	$1.8 * X^{0.81}$	Area/BS
5	O-XYLENE	395	405	Middle	$2 * X^{0.84}$	Area/BS

Calibration curve

Linear

Factor * X

With X = $[(Area + AreaOfs) / BS]$

Name	Value
Factor	1
BS	0

Compound name

Retention time window in seconds

Peak integration mode

Corrective factor or Corrective linearisation formula in comparison with the reference compound

In the substances table of the ambient air:

- The **benzene** is the **reference linear compound** with a factor = **1.00**
- The others substances have a corrective linearisation curve in comparison with the reference linear compound **BENZENE**.

Example: the corrective linearisation curve of the Toluene (in comparison of the Benzene) is:
 $1.6 \times (area/BS)^{0.88}$

- The mass for the toluene will be: $1.6 \times (real\ area\ peak\ of\ toluene / BS)^{0.88}$.
- The "Select peak" corresponds to the peak integration mode
 - o MIDDLE: the best centred in the time window,
 - o MAX: the more important peak in the time window,
 - o SUM: the sum of all peaks in the time window (not used in this table).

M. 2. 1. STANDARD GAS SUBSTANCES TABLE

Substances table information

Substances table name: CAL-30MN Author: Chromato-Sud

For the analyzer serial number: #25360611 Analyzer type: airTOXIC-CALIB

Substances

#	Name	RT Min	RT Max	Select Peak	GC Result formula	With X=
1	BENZENE-STD	131	141	Middle	$X / (0.0602 * [\text{SampleVol}])$	Area
2	TOLUENE	251	261	Middle	$1.6 * X^{0.88}$	Area/BS
3	ETHYLBENZENE	360	370	Middle	$2 * X^{0.88}$	Area/BS
4	M&P-XYLENES	370	380	Middle	$1.8 * X^{0.81}$	Area/BS
5	O-XYLENE	395	405	Middle	$2 * X^{0.84}$	Area/BS
6	BENZENE	131	141	Sum	X	Area/BS

Calibration curve

Linear Auto-Calibration

X / Conc.

With X = Area + AreaOfs

Name	Value
Conc.	0.0602
AreaOfs	0
Average point N=	1
Min BS	3000
Max BS	50000

In the standard gas substances table, some parameters are different in comparison with the ambient air substances table:

The reference compound will be placed on the first line.

- The “**Min BS**” corresponds to the **smallest acceptable value for the “BS” with MIDDLE amplification of the electrometer (amplification 2).**
- The “**Max BS**” corresponds to the **largest acceptable value for the “BS” with MIDDLE amplification of the electrometer (amplification 2).**
- In the “**Conc.**”: we introduce the reference compound concentration expressed in **mg by m³** (the volume unit is programmed in the microprocessor and cannot be modified).
 - In this example : the internal standard gas concentration is : 18.5 ppb at 20 °C (mol. volume : 24,04 l), the concentration will be :

$$(18.5 \times 78.11) / 24.04 = 0.0602 \text{ mg/m}^3$$

- This value (0.0602) is introduced in the “**Conc.**” field for the reference compound. The other corrective factors are not changed.
- In the “**Calibration curve**” field, we introduce “**Linear Auto-Calibration**” to indicate that the **reference compound is BENZENE.**

In the “**Average point N=**” field, we select the number **1**. This number permits to calculate the BS on one point de calibration (if the value is included between the window created by “**Min BS**” and “**Max BS**”). For more information, see **SMQ 0016-05 AutoCalibration 147 UK.pdf** manual.

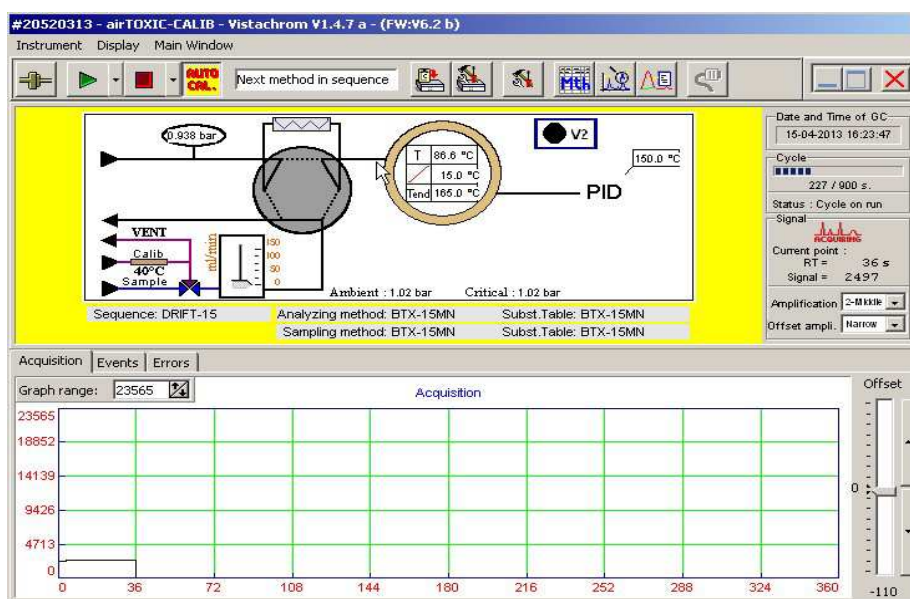
In the case of the standard gas replacement (from a permeation tube in an internal or external oven or from a gas cylinder), the parameters of the first line of the substances table of the calibration method will have to be updated by the user with the new concentration of BENZENE.

M. 6. AUTO-CALIBRATION ACTIVATION

To use the auto-calibration function, the analyser has to work with the routine working sequence.

In this sequence, CHROMATOTEC Group / airmotec advises to program 4 standard gas analyses by day to validate in continuous the ambient air measurements. The substances table must be configured as indicated in the previous.

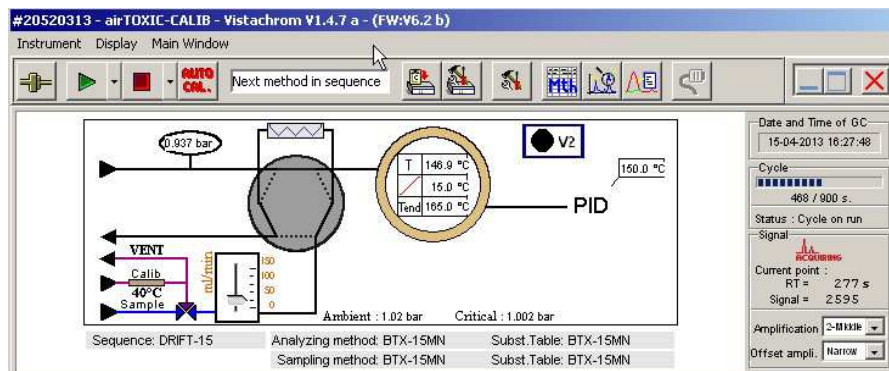
To activate the auto-calibration, the user will have to click on the  icon. The on-line window indicates to the user that the auto-calibration is activated by the Vistachrom screen colour: Yellow like:



Auto-calibration option activated

To stop the auto-calibration option, you have to click on the  icon.

The Vistachrom on-line window becomes white like:



Auto-calibration option deactivated

N. PID CLEANING

The cleaning of the lamp window can be necessary when there is a great loss of sensitivity of the analyser due to pollution on the surface of lamp area by condensation of high boiling points compounds.

CAUTION: Do not disassemble detector when hot or when line power is on.

N. 1. LAMP WINDOW CLEANING WITH SOLVENTS

- Switch off the analyser when it is in stand by status. LED “Stand By” and “OK” lit. Let the detector cool down to ambient temperature.
- Turn off the lamp and oven if necessary. Allow time to the detector to cool down to ambient temperature.
- Remove carefully lamp housing from the lamp holder.
- Add a drop of acetone to window and wipe it with a clean cotton material for 2-3 minutes, then add a drop of ethanol and wipe for 2-3 minutes.
- When the lamp window is contaminated too strongly (no response or it is reduced dramatically) clean it with PID lens polishing powder then rinse with water. Next use acetone and ethanol as presciently indicated.

CAUTION: Lamp window can be also cleaned by conditioning the detector in oxygen flow when the lamp is on.

- Dry the window with air.
- Carefully place the lamp housing and delicately set up the plate of maintenance and power supply of the lamp.

N. 2. CLEANING OF PID INTERNAL COMPONENTS

The parts to be cleaned are those which are in contact with analyst:

- Ionization chamber
- VUV Lamp
- Gas inlet

CAUTION: PID internal components requires in cleaning just when the baseline noise and drift cannot be decreased by any other ways.

- Before disassembling the detector, try to clean it by conditioning in the carrier gas flow at 190 °C for 24 hours.
- Do not wash the ceramic insulators (when highly contaminating they must be replaced).
- To delicately draw the plate from maintenance and power supply the lamp by supporting the lamp so that it did not leave its site brutally and remove the lamp housing with lamp.
- Remove the nut and remove screws which fixed electrodes and take the spacer, insulators and electrodes out of the detector body.

CAUTION: Use the tweezers for handling ceramic internal component to avoid contamination.

- Clean the electrodes and gas inlet using acetone, chloroform and ethanol.
- Install the insulators, electrodes into the detector body and drive by the screws, install metal spacer and lock with nut.
- Install the lamp in housing with precaution.
- Delicately replace the power supply and fixing plate of the lamp.

O. LAMP REPLACEMENT

- Stop the analyser and let the lamp cool down to ambient temperature.
- Remove the lamp housing with the lamp.
- Disconnect the lamp leads from the lamp and remove it from the housing.
- Install the other lamp to housing, bring its wires out through the hole in the top of housing and connect them to the power supply leads.

Place the lamp housing with lamp to detector body and connect it.

P. TROUBLE SHOOTING GUIDE

For any problem, please look at our customer service website: <http://support.chromatotec.com> using your access code.

If you don't have your code, contact our customer service:

Email: support@chromatotec.com

Tel: 0033 (0)5 57 94 06 26