

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000032301_01

AMS designation: PG-350E for NO_x, SO₂, CO, CO₂ and O₂

Manufacturer: HORIBA Europe GmbH
Julius-Kronenberg-Str. 9
42799 Leichlingen
Germany

Test Laboratory: TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and certified
according to the standards

EN 15267-1: 2009, EN 15267-2: 2009, EN 15267-3: 2007
and EN 14181: 2004

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 13 pages).



Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

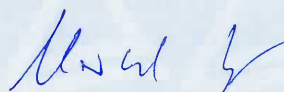
www.tuv.com
ID 0000032301

Publication in the German Federal Gazette
(BAnz) of 05 March 2013

This certificate will expire on:
04 March 2023

German Federal Environment Agency
Dessau, 05 March 2018

TÜV Rheinland Energy GmbH
Cologne, 04 March 2018



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Test institute accredited to EN ISO/IEC 17025:2005 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to the certificate D-PL-11120-02-00.

Test Report:	936/21217617/A dated 05 October 2012
Initial certification:	05 March 2013
Expiry date:	04 March 2023
Certificate:	Renewal (of previous certificate 0000032301 dated 22 March 2013 valid until 04 March 2018)
Publication:	BAnz AT 05.03.2013 B10, chapter I no. 5.2

Approved application

The tested AMS is suitable for use at combustion plants according to EC Directive 2001/80/EC (13th BImSchV), at waste incineration plants according to EC Directive 2000/76/EC (17th BImSchV), the 27th BImSchV, the 30th BImSchV and TA Luft. The measured ranges have been selected so as to cater for as broad a field of application as possible.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a seven-months field test at a municipal waste incinerator.

The AMS is approved for an ambient temperature range of +5 °C to +40 °C.

The notification of suitability of the AMS, performance testing and the uncertainty calculation have been effected on the basis of the regulations applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure that this AMS is suitable for monitoring the limit values and oxygen concentrations relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the installation at which it will be installed.

Basis of the certification

This certification is based on:

- Test report 936/21217617/A dated 05 October 2012 issued by TÜV Rheinland Energie und Umwelt GmbH
- Suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- The ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz AT 05.03.2013 B10, chapter I no. 5.2,
UBA announcement dated 05 March 2013:

AMS designation:

PG-350E for NO_x, SO₂, CO, CO₂ and O₂

Manufacturer:

Horiba Europe GmbH, Leichlingen

Field of application:

For plants requiring official approval and for plants according to the 27th BImSchV

Measuring ranges during performance testing:

Component	Certification range	Supplementary range	Unit
NO _x	0–205 ¹	0–2050 ²	mg/m ³
SO ₂	0–143	0–1430	mg/m ³
CO	0–75	0–1250	mg/m ³
CO ₂	0–20	-	Vol.-%
O ₂	0–25	0–10	Vol.-%

¹ expressed as NO₂. This corresponds to ~0–134 mg/m³ NO.

² expressed as NO₂. This corresponds to ~0–1340 mg/m³ NO.

Software version:

P2000788001D/1.11

Restrictions:

None

Notes:

1. The maintenance interval is four weeks.
2. The certification range for SO₂ is inappropriate for the purpose of monitoring the daily mean value in accordance with 17th BImSchV.
3. The internal dryer for the sample gas flow inside the PG-350E must be bypassed.
4. The type PD-100 permeation dryer manufactured by Horiba is required for measuring SO₂.

Test Report:

TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no.: 936/21217617/A dated 5 October 2012

Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4, chapter V notification 3,
UBA announcement dated 03 July 2013:

3 Notification as regards Federal Environment Agency (UBA) notice of 12 February 2013 (BAnz AT 05.03.2013 B10, chapter I number 5.2)

The PG-350E measuring system for NO_x, SO₂, CO, CO₂ and O₂ manufactured by Horiba Europe GmbH can also be operated in the measuring range 0–6250 mg/m³ (≅ 0–5000 ppm) for the component CO and in the measuring range 0–8580 mg/m³ (≅ 0–3000 ppm) for the component SO₂.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 March 2013

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, chapter VI notification 14,
UBA announcement dated 27 February 2014:

14 Notification as regards Federal Environment Agency notices of 12 February 2013 (BAnz AT 05.03.2013 B10, chapter I number 5.2) and of 3 July 2013 (BAnz AT 23.07.2013 B4 chapter V 3rd notification)

The current software version of the PG-350E measuring system for NO_x, SO₂, CO, CO₂ and O₂ manufactured by Horiba Europe GmbH is:

P2000788001E / 1.12

Moreover, the manufacturer changed the configuration of the measuring range to enable the operator to change the high measuring ranges for CO (0–5000 ppm) and SO₂ (0–3000 ppm) via the user interface. It is now no longer necessary for the manufacturer to switch between measuring ranges with specific service software.

Opinion stated by TÜV Rheinland Energie und Umwelt GmbH dated 9 September 2013

Publication in the German Federal Gazette: BAnz AT 31.07.2017 B12, chapter II notification 16, UBA announcement dated 13 July 2017:

16 Notification as regards Federal Environment Agency notices of 12 February 2013 (BAnz AT 05.03.2013 B10, chapter I number 5.2) and of 27 February 2014 (BAnz AT 01.04.2014 B12 chapter VI 14th notification)

The current software version of the PG-350E measuring system for NO_x, SO₂, CO, CO₂ and O₂ manufactured by Horiba Europe GmbH is:

P2000788001F/1.18

With the introduction of the new software version, the instrument is now available as PG-350E and PG-350EDR. The measuring system provides for the following measuring ranges in the respective instrument version:

PG-350E

Measured components:	Certification range	Supplementary range	Unit
O ₂	0–25	0–10	Vol.-%
CO	0–75	0–1200	mg/m ³
SO ₂	0–143	0–1430	mg/m ³
NO _x	0–205	0–2050	mg/m ³ ¹
CO ₂	0–20	-	Vol.-%

¹ NO_x expressed as NO₂. corresponds to 0–134 mg/m³ and 0–1340 mg/m³ NO_x as NO respectively.

PG-350EDR

Measured components:	Certification range	Supplementary range	Unit
O ₂	0–25	0–10	Vol.-%
CO	0–75	0–6250 ¹	mg/m ³
SO ₂	0–143	0–8580 ²	mg/m ³
NO _x	0–205	0–2050	mg/m ³ ³
CO ₂	0–20	-	Vol.-%

¹ Only if the smallest measuring range is 0–250 mg/m³.

² Only if the smallest measuring range is 0–572 mg/m³.

³ NO_x expressed as NO₂. corresponds to 0–134 mg/m³ and 0–1340 mg/m³ NO_x as NO respectively.

Statement issued by TÜV Rheinland Energy GmbH dated 8 March 2017

Certified product

This certification applies to automated measurement systems conforming to the following description:

The PG-350E measuring system is a multi-component analyser which uses various measuring principles depending on the component to be measured. The following table provides an overview of the different principles used:

Measured component	Measuring principle
NO _x	Chemiluminescence
CO, SO ₂ , CO ₂	Infra-red absorption (NDIR)
O ₂	Paramagnetism

The Horiba PG-350E measuring system comprises the main components described below:

Sampling

Sampling probe: M&C Typ PSP 4000-H/C Test gas filter, heated, type SP-2K, ceramic material, pore width 2 µm

Sampling line: M&C type PSP-W 4M 4/6 (length during performance testing ~5 m) (max. 120 °C)

Analyser

Horiba: PG-350E

Sample gas dryer

Horiba permeation dryer type PD-100 with 100 permeation tubes

or

M&C Analysentechnik condensing dryer type PSS-5

The measuring system may be operated with the PD-100 permeation dryer manufactured by Horiba or with the PSS-5 condensing dryer manufactured by M&C Analysentechnik.

Sample gas is transported to the measuring system via a heated probe. The probe is equipped with a filter located inside which is made of ceramic and has a pore width of 2 µm. Sample gas is further transported to the sample gas dryer via a heated PFTE line and from there to the analyser via an unheated PFTE line. The pump unit is located downstream of the measuring cell.

Having integrated several measuring cells, the instrument performs simultaneous measurement of multiple components. Sample gas continuously flows through the appropriate measuring cell of the measuring system.

The current software version is:

P2000788001F/1.18

The current manual version is:

GZ0000306268C September 2017

General remarks

This certificate is based upon the equipment tested. The manufacturer is responsible for ensuring that on-going production complies with the requirements of the EN 15267. The manufacturer is required to maintain an approved quality management system controlling the manufacturing process for the certified product. Both the product and the quality management systems shall be subject to regular surveillance.

If a product of the current production does not conform to the certified product, TÜV Rheinland Energy GmbH must be notified at the address given on page 1.

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate.

This document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. Upon revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must no longer be used.

The relevant version of this certificate and its expiration date are also accessible on the internet at qal1.de.

Certification of the PG-350E measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Initial certification according to EN 15267:

Certificate no. 0000032301: 22 March 2013
Expiry date of the certificate: 04 March 2018

Test report: 936/21217617/A dated 05 October 2012
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 05.03.2013 B10, chapter I, No. 5.2
UBA announcement dated 12 February 2013

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 March 2013
Publication: BAnz AT 23.07.2013 B4, chapter V, notification 3
UBA announcement dated 03 July 2013
(Additional measuring ranges for CO and SO₂)

Statement issued by TÜV Rheinland Energy GmbH dated 9 September 2013
Publication: BAnz AT 01.04.2014 B12, chapter VI notification 14
UBA announcement dated 27 February 2014
(User can set large measuring ranges)

Statement issued by TÜV Rheinland Energy GmbH dated 8 March 2017
Publication: BAnz AT 31.07.2017 B12, chapter II notification 16
UBA announcement dated 13 July 2017
(New software version and measuring ranges for various instrument versions)

Renewal of the certificate

Certificate no. 0000032301_01: 05 March 2018
Expiry date of the certificate: 04 March 2023

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	Chemiluminescence

Test report

Test laboratory	936/21217617/A
Date of report	TÜV Rheinland
	2012-10-08

Measured component

Certification range	NO _x as NO
	0 - 134 mg/m ³

Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.84 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	0.00 mg/m ³
Sum of negative CS at reference point	-0.70 mg/m ³
Maximum sum of cross sensitivities	0.84 mg/m ³
Uncertainty of cross sensitivity	0.487 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	0.893 mg/m ³	0.797 (mg/m ³) ²
Lack of fit	u _{lof}	0.580 mg/m ³	0.336 (mg/m ³) ²
Zero drift from field test	u _{d,z}	0.286 mg/m ³	0.082 (mg/m ³) ²
Span drift from field test	u _{d,s}	2.035 mg/m ³	4.141 (mg/m ³) ²
Influence of ambient temperature at span	u _t	1.332 mg/m ³	1.774 (mg/m ³) ²
Influence of supply voltage	u _v	0.306 mg/m ³	0.094 (mg/m ³) ²
Cross sensitivity (interference)	u _i	0.487 mg/m ³	0.238 (mg/m ³) ²
Influence of sample gas flow	u _p	0.113 mg/m ³	0.013 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	1.083 mg/m ³	1.173 (mg/m ³) ²
Converter efficiency for AMS measuring NO _x	u _{ce}	3.250 mg/m ³	10.563 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max, j})^2} \quad 4.38 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 8.59 \text{ mg/m}^3$$

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 131 mg/m³ 6.6

U in % of the ELV 131 mg/m³ 20.0

U in % of the ELV 131 mg/m³ 15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	NDIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	SO ₂ 0 - 143 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.54 mg/m ³
Sum of negative CS at zero point	-0.69 mg/m ³
Sum of positive CS at reference point	0.70 mg/m ³
Sum of negative CS at reference point	-2.60 mg/m ³
Maximum sum of cross sensitivities	-2.60 mg/m ³
Uncertainty of cross sensitivity	-1.503 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u ²
Standard deviation from paired measurements under field conditions *	u _D 1.293 mg/m ³	1.672 (mg/m ³) ²
Lack of fit	u _{lof} 0.578 mg/m ³	0.334 (mg/m ³) ²
Zero drift from field test	u _{d,z} 1.965 mg/m ³	3.861 (mg/m ³) ²
Span drift from field test	u _{d,s} -2.171 mg/m ³	4.713 (mg/m ³) ²
Influence of ambient temperature at span	u _t 1.752 mg/m ³	3.070 (mg/m ³) ²
Influence of supply voltage	u _v 0.790 mg/m ³	0.624 (mg/m ³) ²
Cross sensitivity (interference)	u _i -1.503 mg/m ³	2.258 (mg/m ³) ²
Influence of sample gas flow	u _p 0.258 mg/m ³	0.067 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 1.156 mg/m ³	1.336 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	4.23 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	8.30 mg/m ³

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 60 mg/m³	13.8
U in % of the ELV 60 mg/m³	20.0
U in % of the ELV 60 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	NDIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	CO 0 - 75 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	0.50 mg/m ³
Sum of negative CS at reference point	-0.65 mg/m ³
Maximum sum of cross sensitivities	-0.65 mg/m ³
Uncertainty of cross sensitivity	-0.377 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	0.597 mg/m ³	0.356 (mg/m ³) ²
Lack of fit	u _{lof}	0.264 mg/m ³	0.070 (mg/m ³) ²
Zero drift from field test	u _{d,z}	0.840 mg/m ³	0.706 (mg/m ³) ²
Span drift from field test	u _{d,s}	-0.675 mg/m ³	0.456 (mg/m ³) ²
Influence of ambient temperature at span	u _t	0.866 mg/m ³	0.750 (mg/m ³) ²
Influence of supply voltage	u _v	0.286 mg/m ³	0.082 (mg/m ³) ²
Cross sensitivity (interference)	u _i	-0.377 mg/m ³	0.142 (mg/m ³) ²
Influence of sample gas flow	u _b	0.036 mg/m ³	0.001 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	0.606 mg/m ³	0.368 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 1.71 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 3.35 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 50 mg/m³ 6.7

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 50 mg/m³ 10.0

Requirement of EN 15267-3

U in % of the ELV 50 mg/m³ 7.5

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	NDIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	CO ₂	0 - 20 Vol.-%
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	0.00 Vol.-%
Sum of positive CS at reference point	0.00 Vol.-%
Sum of negative CS at reference point	-0.11 Vol.-%
Maximum sum of cross sensitivities	-0.11 Vol.-%
Uncertainty of cross sensitivity	-0.064 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

				<i>u</i> ²
Standard deviation from paired measurements under field conditions *	<i>u_D</i>	0.021 Vol.-%	0.000 (Vol.-%) ²	
Lack of fit	<i>u_{lof}</i>	-0.115 Vol.-%	0.013 (Vol.-%) ²	
Zero drift from field test	<i>u_{d,z}</i>	0.267 Vol.-%	0.071 (Vol.-%) ²	
Span drift from field test	<i>u_{d,s}</i>	0.238 Vol.-%	0.057 (Vol.-%) ²	
Influence of ambient temperature at span	<i>u_t</i>	0.115 Vol.-%	0.013 (Vol.-%) ²	
Influence of supply voltage	<i>u_v</i>	0.051 Vol.-%	0.003 (Vol.-%) ²	
Cross sensitivity (interference)	<i>u_i</i>	-0.064 Vol.-%	0.004 (Vol.-%) ²	
Influence of sample gas flow	<i>u_p</i>	-0.007 Vol.-%	0.000 (Vol.-%) ²	
Uncertainty of reference material at 70% of certification range	<i>u_{rm}</i>	0.162 Vol.-%	0.026 (Vol.-%) ²	

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (<i>u_c</i>)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.43 Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.85 Vol.-%

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC	U in % of the range 20 Vol.-%	4.2
Requirement of EN 15267-3	U in % of the range 20 Vol.-%	10.0 **
	U in % of the range 20 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 10.0 % was used for this.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	Paramagnetismus

Test report

Test laboratory	TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	O ₂	0 - 25 Vol.-%
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	0.00 Vol.-%
Sum of positive CS at reference point	0.00 Vol.-%
Sum of negative CS at reference point	0.00 Vol.-%
Maximum sum of cross sensitivities	0.00 Vol.-%
Uncertainty of cross sensitivity	0.000 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

				u ²
Standard deviation from paired measurements under field conditions *	u _D	0.063 Vol.-%	0.004 (Vol.-%) ²	
Lack of fit	u _{lof}	-0.014 Vol.-%	0.000 (Vol.-%) ²	
Zero drift from field test	u _{d,z}	0.075 Vol.-%	0.006 (Vol.-%) ²	
Span drift from field test	u _{d,s}	0.092 Vol.-%	0.008 (Vol.-%) ²	
Influence of ambient temperature at span	u _t	0.084 Vol.-%	0.007 (Vol.-%) ²	
Influence of supply voltage	u _v	0.018 Vol.-%	0.000 (Vol.-%) ²	
Cross sensitivity (interference)	u _i	0.000 Vol.-%	0.000 (Vol.-%) ²	
Influence of sample gas flow	u _p	-0.003 Vol.-%	0.000 (Vol.-%) ²	
Uncertainty of reference material at 70% of certification range	u _{rm}	0.202 Vol.-%	0.041 (Vol.-%) ²	

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.26 Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.51 Vol.-%

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC	U in % of the range 25 Vol.-%	2.0
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	10.0 **
	U in % of the range 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 10.0 % was used for this.