

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT		

Input values

Component	Measuring range	Emissions limit value	Confidence interval
CO	1,500.00 mg/m ³	1,500.00 mg/m ³	10 %
CO ₂	25.00 Vol%	25.00 Vol%	10 % ²⁾
NO	2,000.00 mg/m ³	2,000.00 ¹⁾ mg/m ³	20 %
NO ₂	500.00 mg/m ³	500.00 mg/m ³	20 %
N ₂ O	mg/m ³	mg/m ³	20 % ²⁾
SO ₂	1,500.00 mg/m ³	1,500.00 mg/m ³	20 %
HCl	15.00 mg/m ³	15.00 mg/m ³	40 %
HF	3.00 mg/m ³	3.00 mg/m ³	40 %
NH ₃	mg/m ³	mg/m ³	40 % ²⁾
H ₂ O	40.00 Vol%	40.00 Vol%	10 % ²⁾
CH ₄	mg/m ³	mg/m ³	30 % ²⁾
O ₂	21.00 Vol%	21.00 Vol%	10 % ²⁾
TOC	15.00 mg/m ³	15.00 mg/m ³	30 %

1) The emissions limit value for NO_x is give as NO₂-concentration, therefore the value as NO-concentration is decreased by the factor 1.53

2) For this measuring component no emission limit values and confidence intervals are defined: Therefore full scale values and exemplary confidence intervals are used here

Interferent	Concentration	Interferent	Concentration
Oxygen (O ₂)	3.00 Vol%	Ammonia (NH ₃)	20.00 mg/m ³
Oxygen (O ₂)	21.00 Vol%	Sulfur dioxide (SO ₂)	200.00 mg/m ³
Water (H ₂ O)	30.00 Vol%	Sulfur dioxide (SO ₂)	1,000.00 mg/m ³ ⁵⁾
Carbon monoxide (CO)	300.00 mg/m ³	Hydrogen chloride (HCl)	50.00 mg/m ³
Carbon dioxide (CO ₂)	15.00 Vol%	Hydrogen chloride (HCl)	200.00 mg/m ³ ⁶⁾
Methane (CH ₄)	50.00 mg/m ³		
Dinitrogen oxide (N ₂ O)	20.00 mg/m ³		
Dinitrogen oxide (N ₂ O)	100.00 mg/m ³ ⁴⁾		
Nitrogen monoxide (NO)	300.00 mg/m ³		
Nitrogen dioxide (NO ₂)	30.00 mg/m ³		

3) Substitution value when oxygen is absent

4) In case of fluidised-bed firing

5) In case of coal-fired power stations without desulfurization

6) in case of coal-fired power stations

Summary of the results

Component	s(AMS) values		Quality of the measurement
	Zero point	Span point	
CO	30.447	43.535	Requirements fulfilled
CO ₂	0.602	0.753	Requirements fulfilled
NO	47.287	67.824	Requirements fulfilled
NO ₂	16.896	17.647	Requirements fulfilled
N ₂ O			
SO ₂	38.732	57.513	Requirements fulfilled
HCl	0.540	0.590	Requirements fulfilled
HF	0.146	0.126	Requirements fulfilled
NH ₃			
H ₂ O	0.934	1.005	Requirements fulfilled
CH ₄			
O ₂	0.222	0.272	Requirements fulfilled
TOC	0.690	0.664	Requirements fulfilled

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Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	CO

Input values

Measuring range	1,500	mg/m ³
Emissions limit value	1,500	mg/m ³
Confidence interval	10	%

General information

Maintenance interval	6 months	Detection limit	0.32 mg/m ³
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Calculation of the expanded uncertainty

Interferent	Zero point	Span point
3 Vol% Oxygen (O2)	0.00 mg/m ³	0.00 mg/m ³
21 Vol% Oxygen (O2)	0.00 mg/m ³	0.00 mg/m ³
30 Vol% Water (H2O)	0.00 mg/m ³	15.00 mg/m ³
300 mg/m ³ Carbon monoxide (CO)		
15 Vol% Carbon dioxide (CO2)	24.00 mg/m ³	0.00 mg/m ³
50 mg/m ³ Methane (CH4)	0.00 mg/m ³	0.00 mg/m ³
20 mg/m ³ Dinitrogen oxide (N2O)	0.00 mg/m ³	0.00 mg/m ³
100 mg/m ³ Dinitrogen oxide (N2O)	-27.00 mg/m ³	-52.50 mg/m ³
300 mg/m ³ Nitrogen monoxide (NO)	0.00 mg/m ³	0.00 mg/m ³
30 mg/m ³ Nitrogen dioxide (NO2)	0.00 mg/m ³	0.00 mg/m ³
20 mg/m ³ Ammonia (NH3)	0.00 mg/m ³	10.50 mg/m ³
200 mg/m ³ Sulfur dioxide (SO2)	0.00 mg/m ³	0.00 mg/m ³
1000 mg/m ³ Sulfur dioxide (SO2)	0.00 mg/m ³	0.00 mg/m ³
50 mg/m ³ Hydrogen chloride (HCl)	0.00 mg/m ³	0.00 mg/m ³
200 mg/m ³ Hydrogen chloride (HCl)	0.00 mg/m ³	0.00 mg/m ³
Sum of the positive cross-sensitivities	24.00 mg/m ³ ⁸⁾	25.50 mg/m ³ ⁹⁾
Sum of the negative cross-sensitivities	-27.00 mg/m ³ ⁸⁾	-52.50 mg/m ³ ⁹⁾

8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	CO
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

	Zero point	Span point
	30.000 mg/m ³	30.000 mg/m ³
	22.500 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-27.000 mg/m ³
	3.000 mg/m ³	-25.500 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-1.500 mg/m ³
	3.000 mg/m ³	4.500 mg/m ³
	-27.000 mg/m ³	-52.500 mg/m ³
	0.220 mg/m ³	0.220 mg/m ³
	13.666 mg/m ³	13.666 mg/m ³
	21.000 mg/m ³	21.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	17.321 mg/m ³
Zero drift from the field test	$u_{d,z}$	=	12.990 mg/m ³
Span drift from the field test	$u_{d,s}$	=	0.000 mg/m ³
Influence of ambient temperature at span point	u_t	=	1.732 mg/m ³
Influence of sample gas pressure	u_p	=	0.000 mg/m ³
Influence of sample gas flow	u_f	=	0.000 mg/m ³
Influence of voltage	u_v	=	1.732 mg/m ³
Cross-sensitivity	u_i	=	-15.588 mg/m ³
Repeatability at span point	u_r	=	0.127 mg/m ³ ¹⁰⁾
Standard deviation from paired measurements under field conditions	u_D	=	7.890 mg/m ³ ¹⁰⁾
Uncertainty of provided reference material	u_{rm}	=	12.124 mg/m ³
Misalignment	u_{mb}	=	0.000 mg/m ³
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000 mg/m ³
Changes of response factors	u_{rf}	=	0.000 mg/m ³

Standard uncertainty

	Zero point	Span point
	17.321 mg/m ³	17.321 mg/m ³
	12.990 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-15.588 mg/m ³
	1.732 mg/m ³	-14.722 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.866 mg/m ³
	1.732 mg/m ³	2.598 mg/m ³
	-15.588 mg/m ³	-30.311 mg/m ³
	0.127 mg/m ³ ¹⁰⁾	0.127 mg/m ³ ¹¹⁾
	7.890 mg/m ³ ¹⁰⁾	7.890 mg/m ³ ¹¹⁾
	12.124 mg/m ³	12.124 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		30.447 mg/m ³	43.535 mg/m ³

Verification of compliance with the requirements

Combined standard uncertainty	45.43 mg/m ³	according to EN 15267-3
Expanded uncertainty	89.05 mg/m ³	according to EN 15267-3
Relative expanded uncertainty	5.94 %	of the emissions limit value of 1500 mg/m ³
Allowed expanded uncertainty	7.50 %	of the emissions limit value of 1500 mg/m ³
Allowed expanded uncertainty	112.50 mg/m ³	

Result

Requirements fulfilled

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	CO2

Input values

Measuring range	25	Vol%	
Measuring range	25	Vol%	
Confidence interval	10	%	⁷⁾

⁷⁾ Attention: The 2010/75/EU, 2001/80/EC and 2000/76/EC gives no requirements for these components

General information

Maintenance interval	3	months	Detection limit	0.06	Vol%
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Calculation of the expanded uncertainty

Interferent	Zero point	Span point
3 Vol% Oxygen (O2)	0.00 Vol%	0.00 Vol%
21 Vol% Oxygen (O2)	0.00 Vol%	0.00 Vol%
30 Vol% Water (H2O)	-0.33 Vol%	0.48 Vol%
300 mg/m ³ Carbon monoxide (CO)	0.00 Vol%	0.00 Vol%
15 Vol% Carbon dioxide (CO2)		
50 mg/m ³ Methane (CH4)	0.00 Vol%	0.00 Vol%
20 mg/m ³ Dinitrogen oxide (N2O)	0.00 Vol%	0.00 Vol%
100 mg/m ³ Dinitrogen oxide (N2O)	-0.40 Vol%	-0.35 Vol%
300 mg/m ³ Nitrogen monoxide (NO)	0.00 Vol%	0.00 Vol%
30 mg/m ³ Nitrogen dioxide (NO2)	0.00 Vol%	0.00 Vol%
20 mg/m ³ Ammonia (NH3)	0.00 Vol%	-0.35 Vol%
200 mg/m ³ Sulfur dioxide (SO2)	0.00 Vol%	0.00 Vol%
1000 mg/m ³ Sulfur dioxide (SO2)	0.00 Vol%	0.33 Vol%
50 mg/m ³ Hydrogen chloride (HCl)	0.00 Vol%	0.00 Vol%
200 mg/m ³ Hydrogen chloride (HCl)	0.00 Vol%	-0.13 Vol%
Sum of the positive cross-sensitivities	0.00 Vol% ⁸⁾	0.80 Vol% ⁹⁾
Sum of the negative cross-sensitivities	-0.73 Vol% ⁸⁾	-0.83 Vol% ⁹⁾

⁸⁾, ⁹⁾ The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	CO2
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

	Largest difference according to type approval			
	Zero point		Span point	
Lack-of-fit (Linearity)	0.175	Vol%	0.175	Vol%
Zero drift from the field test	0.525	Vol%	0.000	Vol%
Span drift from the field test	0.000	Vol%	0.675	Vol%
Influence of ambient temperature at span point	0.075	Vol%	0.525	Vol%
Influence of sample gas pressure	0.000	Vol%	0.000	Vol%
Influence of sample gas flow	0.000	Vol%	-0.025	Vol%
Influence of voltage	-0.025	Vol%	0.100	Vol%
Cross-sensitivity	-0.725	Vol%	-0.825	Vol%
Repeatability at span point	0.050	Vol%	0.050	Vol%
Standard deviation from paired measurements under field conditions	0.354	Vol%	0.354	Vol%
Uncertainty of provided reference material	0.350	Vol%	0.350	Vol%
Misalignment	0.000	Vol%	0.000	Vol%
Conversion rate of AMS for measurement of NOx	0.000	Vol%	0.000	Vol%
Changes of response factors	0.000	Vol%	0.000	Vol%

Process characteristics

		Standard uncertainty			
		Zero point		Span point	
Lack-of-fit (Linearity)	u_{lof} =	0.101	Vol%	0.101	Vol%
Zero drift from the field test	$u_{d,z}$ =	0.303	Vol%	0.000	Vol%
Span drift from the field test	$u_{d,s}$ =	0.000	Vol%	0.390	Vol%
Influence of ambient temperature at span point	u_t =	0.043	Vol%	0.303	Vol%
Influence of sample gas pressure	u_p =	0.000	Vol%	0.000	Vol%
Influence of sample gas flow	u_f =	0.000	Vol%	-0.014	Vol%
Influence of voltage	u_v =	-0.014	Vol%	0.058	Vol%
Cross-sensitivity	u_i =	-0.419	Vol%	-0.476	Vol%
Repeatability at span point	u_r =	0.029	Vol%	0.029	Vol%
Standard deviation from paired measurements under field conditions	u_D =	0.205	Vol%	0.205	Vol%
Uncertainty of provided reference material	u_{rm} =	0.202	Vol%	0.202	Vol%
Misalignment	u_{mb} =	0.000	Vol%	0.000	Vol%
Conversion rate of AMS for measurement of NOx	u_{ce} =	0.000	Vol%	0.000	Vol%
Changes of response factors	u_{rf} =	0.000	Vol%	0.000	Vol%

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		0.602 Vol%	0.753 Vol%

Verification of compliance with the requirements

Combined standard uncertainty	0.81	Vol%	according to EN 15267-3
Expanded uncertainty	1.59	Vol%	according to EN 15267-3
Relative expanded uncertainty	6.36	%	of the measuring range of 25 Vol%
Allowed expanded uncertainty	7.50	%	of the measuring range of 25 Vol%
Allowed expanded uncertainty	1.88	Vol%	

Result

Requirements fulfilled

Attention: The 2010/75/EU, 2001/80/EC and 2000/76/EC gives no requirements for these components.

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	NO

Input values

Measuring range	2,000	mg/m ³
Emissions limit value	2,000	mg/m ³
Confidence interval	20	%

General information

Maintenance interval	6 months	Detection limit	0.76 mg/m ³
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Calculation of the expanded uncertainty

Interferent

3 Vol% Oxygen (O2)
21 Vol% Oxygen (O2)
30 Vol% Water (H2O)
300 mg/m ³ Carbon monoxide (CO)
15 Vol% Carbon dioxide (CO2)
50 mg/m ³ Methane (CH4)
20 mg/m ³ Dinitrogen oxide (N2O)
100 mg/m ³ Dinitrogen oxide (N2O)
300 mg/m ³ Nitrogen monoxide (NO)
30 mg/m ³ Nitrogen dioxide (NO2)
20 mg/m ³ Ammonia (NH3)
200 mg/m ³ Sulfur dioxide (SO2)
1000 mg/m ³ Sulfur dioxide (SO2)
50 mg/m ³ Hydrogen chloride (HCl)
200 mg/m ³ Hydrogen chloride (HCl)

Zero point

0.00 mg/m ³
0.00 mg/m ³
-52.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
14.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³

Span point

0.00 mg/m ³
0.00 mg/m ³
32.00 mg/m ³
0.00 mg/m ³
-48.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
20.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
0.00 mg/m ³
12.00 mg/m ³
0.00 mg/m ³
16.00 mg/m ³

Sum of the positive cross-sensitivities

14.00 mg/m³ ⁸⁾

80.00 mg/m³ ⁹⁾

Sum of the negative cross-sensitivities

-52.00 mg/m³ ⁸⁾

-48.00 mg/m³ ⁹⁾

8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	NO
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

	Zero point	Span point
	30.000 mg/m ³	30.000 mg/m ³
	36.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-60.000 mg/m ³
	-8.000 mg/m ³	-30.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-2.000 mg/m ³
	2.000 mg/m ³	-16.000 mg/m ³
	-52.000 mg/m ³	80.000 mg/m ³
	0.780 mg/m ³	0.780 mg/m ³
	30.921 mg/m ³	30.921 mg/m ³
	28.000 mg/m ³	28.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	17.321 mg/m ³
Zero drift from the field test	$u_{d,z}$	=	20.785 mg/m ³
Span drift from the field test	$u_{d,s}$	=	0.000 mg/m ³
Influence of ambient temperature at span point	u_t	=	-4.619 mg/m ³
Influence of sample gas pressure	u_p	=	0.000 mg/m ³
Influence of sample gas flow	u_f	=	0.000 mg/m ³
Influence of voltage	u_v	=	1.155 mg/m ³
Cross-sensitivity	u_i	=	-30.022 mg/m ³
Repeatability at span point	u_r	=	0.450 mg/m ³ ¹⁰⁾
Standard deviation from paired measurements under field conditions	u_D	=	17.853 mg/m ³ ¹⁰⁾
Uncertainty of provided reference material	u_{rm}	=	16.166 mg/m ³
Misalignment	u_{mb}	=	0.000 mg/m ³
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000 mg/m ³
Changes of response factors	u_{rf}	=	0.000 mg/m ³

Standard uncertainty

	Zero point	Span point
	17.321 mg/m ³	17.321 mg/m ³
	20.785 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-34.641 mg/m ³
	-4.619 mg/m ³	-17.321 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-1.155 mg/m ³
	1.155 mg/m ³	-9.238 mg/m ³
	-30.022 mg/m ³	46.188 mg/m ³
	0.450 mg/m ³ ¹⁰⁾	0.450 mg/m ³ ¹¹⁾
	17.853 mg/m ³ ¹⁰⁾	17.853 mg/m ³ ¹¹⁾
	16.166 mg/m ³	16.166 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		47.287 mg/m ³	67.824 mg/m ³

Verification of compliance with the requirements

Combined standard uncertainty	70.94	mg/m ³	according to EN 15267-3
Expanded uncertainty	139.04	mg/m ³	according to EN 15267-3
Relative expanded uncertainty	6.95	%	of the emissions limit value of 2000 mg/m ³
Allowed expanded uncertainty	15.00	%	of the emissions limit value of 2000 mg/m ³
Allowed expanded uncertainty	300.00	mg/m ³	

Result

Requirements fulfilled

Calculation of measurement uncertainty

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Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	NO2

Input values

Measuring range	500	mg/m ³
Emissions limit value	500	mg/m ³
Confidence interval	20	%

General information

Maintenance interval	6 months	Detection limit	0.38 mg/m ³
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Calculation of the expanded uncertainty

Interferent	Zero point	Span point
3 Vol% Oxygen (O2)	0.00 mg/m ³	0.00 mg/m ³
21 Vol% Oxygen (O2)	0.00 mg/m ³	0.00 mg/m ³
30 Vol% Water (H2O)	-7.50 mg/m ³	5.00 mg/m ³
300 mg/m ³ Carbon monoxide (CO)	0.00 mg/m ³	0.00 mg/m ³
15 Vol% Carbon dioxide (CO2)	2.50 mg/m ³	-5.50 mg/m ³
50 mg/m ³ Methane (CH4)	-4.50 mg/m ³	0.00 mg/m ³
20 mg/m ³ Dinitrogen oxide (N2O)	0.00 mg/m ³	0.00 mg/m ³
100 mg/m ³ Dinitrogen oxide (N2O)	5.00 mg/m ³	0.00 mg/m ³
300 mg/m ³ Nitrogen monoxide (NO)	16.00 mg/m ³	15.00 mg/m ³
30 mg/m ³ Nitrogen dioxide (NO2)		
20 mg/m ³ Ammonia (NH3)	0.00 mg/m ³	-5.00 mg/m ³
200 mg/m ³ Sulfur dioxide (SO2)	0.00 mg/m ³	0.00 mg/m ³
1000 mg/m ³ Sulfur dioxide (SO2)	0.00 mg/m ³	0.00 mg/m ³
50 mg/m ³ Hydrogen chloride (HCl)	0.00 mg/m ³	0.00 mg/m ³
200 mg/m ³ Hydrogen chloride (HCl)	0.00 mg/m ³	-13.00 mg/m ³
Sum of the positive cross-sensitivities	23.50 mg/m ³ ⁸⁾	20.00 mg/m ³ ⁹⁾
Sum of the negative cross-sensitivities	-12.00 mg/m ³ ⁸⁾	-23.50 mg/m ³ ⁹⁾

8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	NO2
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

	Zero point	Span point
	7.000 mg/m ³	7.000 mg/m ³
	-11.500 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	15.000 mg/m ³
	6.500 mg/m ³	4.500 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.500 mg/m ³
	1.500 mg/m ³	-3.000 mg/m ³
	23.500 mg/m ³	-23.500 mg/m ³
	0.470 mg/m ³	0.470 mg/m ³
	5.428 mg/m ³	5.428 mg/m ³
	7.000 mg/m ³	7.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	4.041 mg/m ³
Zero drift from the field test	$u_{d,z}$	=	-6.640 mg/m ³
Span drift from the field test	$u_{d,s}$	=	0.000 mg/m ³
Influence of ambient temperature at span point	u_t	=	3.753 mg/m ³
Influence of sample gas pressure	u_p	=	0.000 mg/m ³
Influence of sample gas flow	u_f	=	0.000 mg/m ³
Influence of voltage	u_v	=	0.866 mg/m ³
Cross-sensitivity	u_i	=	13.568 mg/m ³
Repeatability at span point	u_r	=	0.271 mg/m ³ ¹⁰⁾
Standard deviation from paired measurements under field conditions	u_D	=	3.134 mg/m ³ ¹⁰⁾
Uncertainty of provided reference material	u_{rm}	=	4.041 mg/m ³
Misalignment	u_{mb}	=	0.000 mg/m ³
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000 mg/m ³
Changes of response factors	u_{rf}	=	0.000 mg/m ³

Standard uncertainty

	Zero point	Span point
	4.041 mg/m ³	4.041 mg/m ³
	-6.640 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	8.660 mg/m ³
	3.753 mg/m ³	2.598 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.289 mg/m ³
	0.866 mg/m ³	-1.732 mg/m ³
	13.568 mg/m ³	-13.568 mg/m ³
	0.271 mg/m ³ ¹⁰⁾	0.271 mg/m ³ ¹¹⁾
	3.134 mg/m ³ ¹⁰⁾	3.134 mg/m ³ ¹¹⁾
	4.041 mg/m ³	4.041 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

^{10), 11)} For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		16.896 mg/m ³	17.647 mg/m ³

Verification of compliance with the requirements

Combined standard uncertainty	19.05 mg/m ³	according to EN 15267-3
Expanded uncertainty	37.33 mg/m ³	according to EN 15267-3
Relative expanded uncertainty	7.47 %	of the emissions limit value of 500 mg/m ³
Allowed expanded uncertainty	15.00 %	of the emissions limit value of 500 mg/m ³
Allowed expanded uncertainty	75.00 mg/m ³	

Result

Requirements fulfilled

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	SO2

Input values

Measuring range	1,500	mg/m ³
Emissions limit value	1,500	mg/m ³
Confidence interval	20	%

General information

Maintenance interval	6 months	Detection limit	0.24 mg/m ³
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Calculation of the expanded uncertainty

Interferent	Zero point	Span point
3 Vol% Oxygen (O2)	0.00 mg/m ³	0.00 mg/m ³
21 Vol% Oxygen (O2)	0.00 mg/m ³	0.00 mg/m ³
30 Vol% Water (H2O)	25.50 mg/m ³	33.00 mg/m ³
300 mg/m ³ Carbon monoxide (CO)	0.00 mg/m ³	16.50 mg/m ³
15 Vol% Carbon dioxide (CO2)	15.00 mg/m ³	7.50 mg/m ³
50 mg/m ³ Methane (CH4)	0.00 mg/m ³	7.50 mg/m ³
20 mg/m ³ Dinitrogen oxide (N2O)	0.00 mg/m ³	0.00 mg/m ³
100 mg/m ³ Dinitrogen oxide (N2O)	0.00 mg/m ³	7.50 mg/m ³
300 mg/m ³ Nitrogen monoxide (NO)	0.00 mg/m ³	0.00 mg/m ³
30 mg/m ³ Nitrogen dioxide (NO2)	0.00 mg/m ³	0.00 mg/m ³
20 mg/m ³ Ammonia (NH3)	0.00 mg/m ³	7.50 mg/m ³
200 mg/m ³ Sulfur dioxide (SO2)		
1000 mg/m ³ Sulfur dioxide (SO2)		
50 mg/m ³ Hydrogen chloride (HCl)	0.00 mg/m ³	0.00 mg/m ³
200 mg/m ³ Hydrogen chloride (HCl)	0.00 mg/m ³	0.00 mg/m ³
Sum of the positive cross-sensitivities	40.50 mg/m ³ ⁸⁾	79.50 mg/m ³ ⁹⁾
Sum of the negative cross-sensitivities	0.00 mg/m ³ ⁸⁾	0.00 mg/m ³ ⁹⁾

8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	SO2
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

	Zero point	Span point
	16.500 mg/m ³	16.500 mg/m ³
	-37.500 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	46.500 mg/m ³
	19.500 mg/m ³	-22.500 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-1.500 mg/m ³
	-12.000 mg/m ³	1.500 mg/m ³
	40.500 mg/m ³	79.500 mg/m ³
	0.160 mg/m ³	0.160 mg/m ³
	14.717 mg/m ³	14.717 mg/m ³
	21.000 mg/m ³	21.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	9.526 mg/m ³
Zero drift from the field test	$u_{d,z}$	=	-21.651 mg/m ³
Span drift from the field test	$u_{d,s}$	=	0.000 mg/m ³
Influence of ambient temperature at span point	u_t	=	11.258 mg/m ³
Influence of sample gas pressure	u_p	=	0.000 mg/m ³
Influence of sample gas flow	u_f	=	0.000 mg/m ³
Influence of voltage	u_v	=	-6.928 mg/m ³
Cross-sensitivity	u_i	=	23.383 mg/m ³
Repeatability at span point	u_r	=	0.092 mg/m ³ ¹⁰⁾
Standard deviation from paired measurements under field conditions	u_D	=	8.497 mg/m ³ ¹⁰⁾
Uncertainty of provided reference material	u_{rm}	=	12.124 mg/m ³
Misalignment	u_{mb}	=	0.000 mg/m ³
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000 mg/m ³
Changes of response factors	u_{rf}	=	0.000 mg/m ³

Standard uncertainty

	Zero point	Span point
	9.526 mg/m ³	9.526 mg/m ³
	-21.651 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	26.847 mg/m ³
	11.258 mg/m ³	-12.990 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.866 mg/m ³
	-6.928 mg/m ³	0.866 mg/m ³
	23.383 mg/m ³	45.899 mg/m ³
	0.092 mg/m ³ ¹⁰⁾	0.092 mg/m ³ ¹¹⁾
	8.497 mg/m ³ ¹⁰⁾	8.497 mg/m ³ ¹¹⁾
	12.124 mg/m ³	12.124 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		38.732 mg/m ³	57.513 mg/m ³

Verification of compliance with the requirements

Combined standard uncertainty	61.84 mg/m ³	according to EN 15267-3
Expanded uncertainty	121.20 mg/m ³	according to EN 15267-3
Relative expanded uncertainty	8.08 %	of the emissions limit value of 1500 mg/m ³
Allowed expanded uncertainty	15.00 %	of the emissions limit value of 1500 mg/m ³
Allowed expanded uncertainty	225.00 mg/m ³	

Result

Requirements fulfilled

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	HCl

Input values

Measuring range	15	mg/m ³
Emissions limit value	15	mg/m ³
Confidence interval	40	%

General information

Maintenance interval	6	months	Detection limit	0.08	mg/m ³
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Calculation of the expanded uncertainty

Interferent

3 Vol% Oxygen (O ₂)
21 Vol% Oxygen (O ₂)
30 Vol% Water (H ₂ O)
300 mg/m ³ Carbon monoxide (CO)
15 Vol% Carbon dioxide (CO ₂)
50 mg/m ³ Methane (CH ₄)
20 mg/m ³ Dinitrogen oxide (N ₂ O)
100 mg/m ³ Dinitrogen oxide (N ₂ O)
300 mg/m ³ Nitrogen monoxide (NO)
30 mg/m ³ Nitrogen dioxide (NO ₂)
20 mg/m ³ Ammonia (NH ₃)
200 mg/m ³ Sulfur dioxide (SO ₂)
1000 mg/m ³ Sulfur dioxide (SO ₂)
50 mg/m ³ Hydrogen chloride (HCl)
200 mg/m ³ Hydrogen chloride (HCl)

Zero point

0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.09	mg/m ³
0.14	mg/m ³
0.00	mg/m ³
0.23	mg/m ³
0.09	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.18	mg/m ³

Span point

0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.29	mg/m ³
0.00	mg/m ³
0.35	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³

Sum of the positive cross-sensitivities

0.72	mg/m ³	⁸⁾
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0.63	mg/m ³	⁹⁾
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Sum of the negative cross-sensitivities

0.00	mg/m ³	⁸⁾
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0.00	mg/m ³	⁹⁾
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8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	HCI
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

	Zero point	Span point
	0.300 mg/m ³	0.300 mg/m ³
	-0.420 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.450 mg/m ³
	0.120 mg/m ³	-0.525 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.015 mg/m ³
	-0.075 mg/m ³	0.105 mg/m ³
	0.720 mg/m ³	0.630 mg/m ³
	0.150 mg/m ³	0.150 mg/m ³
	0.156 mg/m ³	0.156 mg/m ³
	0.210 mg/m ³	0.210 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	0.173 mg/m ³
Zero drift from the field test	$u_{d,z}$	=	-0.242 mg/m ³
Span drift from the field test	$u_{d,s}$	=	0.000 mg/m ³
Influence of ambient temperature at span point	u_t	=	0.069 mg/m ³
Influence of sample gas pressure	u_p	=	0.000 mg/m ³
Influence of sample gas flow	u_f	=	0.000 mg/m ³
Influence of voltage	u_v	=	-0.043 mg/m ³
Cross-sensitivity	u_i	=	0.416 mg/m ³
Repeatability at span point	u_r	=	0.087 mg/m ³ ¹⁰⁾
Standard deviation from paired measurements under field conditions	u_D	=	0.090 mg/m ³ ¹⁰⁾
Uncertainty of provided reference material	u_{rm}	=	0.121 mg/m ³
Misalignment	u_{mb}	=	0.000 mg/m ³
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000 mg/m ³
Changes of response factors	u_{rf}	=	0.000 mg/m ³

Standard uncertainty

	Zero point	Span point
	0.173 mg/m ³	0.173 mg/m ³
	-0.242 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.260 mg/m ³
	0.069 mg/m ³	-0.303 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.009 mg/m ³
	-0.043 mg/m ³	0.061 mg/m ³
	0.416 mg/m ³	0.364 mg/m ³
	0.087 mg/m ³ ¹⁰⁾	0.087 mg/m ³ ¹¹⁾
	0.090 mg/m ³ ¹⁰⁾	0.090 mg/m ³ ¹¹⁾
	0.121 mg/m ³	0.121 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

^{10), 11)} For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		0.540 mg/m ³	0.590 mg/m ³

Verification of compliance with the requirements

Combined standard uncertainty	0.67 mg/m ³	according to EN 15267-3
Expanded uncertainty	1.31 mg/m ³	according to EN 15267-3
Relative expanded uncertainty	8.74 %	of the emissions limit value of 15 mg/m ³
Allowed expanded uncertainty	30.00 %	of the emissions limit value of 15 mg/m ³
Allowed expanded uncertainty	4.50 mg/m ³	

Result

Requirements fulfilled

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	HF

Input values

Measuring range	3	mg/m ³
Emissions limit value	3	mg/m ³
Confidence interval	40	%

General information

Maintenance interval	3	months	Detection limit	0.08	mg/m ³
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Calculation of the expanded uncertainty

Interferent

3 Vol% Oxygen (O2)
21 Vol% Oxygen (O2)
30 Vol% Water (H2O)
300 mg/m ³ Carbon monoxide (CO)
15 Vol% Carbon dioxide (CO2)
50 mg/m ³ Methane (CH4)
20 mg/m ³ Dinitrogen oxide (N2O)
100 mg/m ³ Dinitrogen oxide (N2O)
300 mg/m ³ Nitrogen monoxide (NO)
30 mg/m ³ Nitrogen dioxide (NO2)
20 mg/m ³ Ammonia (NH3)
200 mg/m ³ Sulfur dioxide (SO2)
1000 mg/m ³ Sulfur dioxide (SO2)
50 mg/m ³ Hydrogen chloride (HCl)
200 mg/m ³ Hydrogen chloride (HCl)

Zero point

0.00	mg/m ³
0.00	mg/m ³
0.05	mg/m ³
-0.08	mg/m ³
0.00	mg/m ³
0.07	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.03	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.03	mg/m ³

Span point

0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
-0.08	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.05	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
-0.03	mg/m ³

Sum of the positive cross-sensitivities

0.17 mg/m³ ⁸⁾

0.05 mg/m³ ⁹⁾

Sum of the negative cross-sensitivities

-0.08 mg/m³ ⁸⁾

-0.11 mg/m³ ⁹⁾

8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	HF
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

	Zero point	Span point
	0.051 mg/m ³	0.051 mg/m ³
	-0.117 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.090 mg/m ³
	-0.111 mg/m ³	0.141 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.003 mg/m ³
	0.030 mg/m ³	0.039 mg/m ³
	0.174 mg/m ³	-0.105 mg/m ³
	0.050 mg/m ³	0.050 mg/m ³
	0.038 mg/m ³	0.038 mg/m ³
	0.042 mg/m ³	0.042 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	0.029 mg/m ³
Zero drift from the field test	$u_{d,z}$	=	-0.068 mg/m ³
Span drift from the field test	$u_{d,s}$	=	0.000 mg/m ³
Influence of ambient temperature at span point	u_t	=	-0.064 mg/m ³
Influence of sample gas pressure	u_p	=	0.000 mg/m ³
Influence of sample gas flow	u_f	=	0.000 mg/m ³
Influence of voltage	u_v	=	0.017 mg/m ³
Cross-sensitivity	u_i	=	0.100 mg/m ³
Repeatability at span point	u_r	=	0.029 mg/m ³ ¹⁰⁾
Standard deviation from paired measurements under field conditions	u_D	=	0.022 mg/m ³ ¹⁰⁾
Uncertainty of provided reference material	u_{rm}	=	0.024 mg/m ³
Misalignment	u_{mb}	=	0.000 mg/m ³
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000 mg/m ³
Changes of response factors	u_{rf}	=	0.000 mg/m ³

Standard uncertainty

	Zero point	Span point
	0.029 mg/m ³	0.029 mg/m ³
	-0.068 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.052 mg/m ³
	-0.064 mg/m ³	0.081 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.002 mg/m ³
	0.017 mg/m ³	0.023 mg/m ³
	0.100 mg/m ³	-0.061 mg/m ³
	0.029 mg/m ³ ¹⁰⁾	0.029 mg/m ³ ¹¹⁾
	0.022 mg/m ³ ¹⁰⁾	0.022 mg/m ³ ¹¹⁾
	0.024 mg/m ³	0.024 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		0.146 mg/m ³	0.126 mg/m ³

Verification of compliance with the requirements

Combined standard uncertainty	0.16 mg/m ³	according to EN 15267-3
Expanded uncertainty	0.32 mg/m ³	according to EN 15267-3
Relative expanded uncertainty	10.69 %	of the emissions limit value of 3 mg/m ³
Allowed expanded uncertainty	30.00 %	of the emissions limit value of 3 mg/m ³
Allowed expanded uncertainty	0.90 mg/m ³	

Result

Requirements fulfilled

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	H2O

Input values

Measuring range	40	Vol%
Measuring range	40	Vol%
Confidence interval	10	% ⁷⁾

7) Attention: The 2010/75/EU, 2001/80/EC and 2000/76/EC gives no requirements for these components

General information

Maintenance interval	6 months	Detection limit	0.04 Vol%
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Calculation of the expanded uncertainty

Interferent	Zero point	Span point
3 Vol% Oxygen (O2)	0.00 Vol%	0.00 Vol%
21 Vol% Oxygen (O2)	0.00 Vol%	0.00 Vol%
30 Vol% Water (H2O)		
300 mg/m ³ Carbon monoxide (CO)	0.80 Vol%	0.76 Vol%
15 Vol% Carbon dioxide (CO2)	0.00 Vol%	0.00 Vol%
50 mg/m ³ Methane (CH4)	-0.20 Vol%	-0.36 Vol%
20 mg/m ³ Dinitrogen oxide (N2O)	0.00 Vol%	0.00 Vol%
100 mg/m ³ Dinitrogen oxide (N2O)	0.00 Vol%	0.00 Vol%
300 mg/m ³ Nitrogen monoxide (NO)	0.00 Vol%	0.00 Vol%
30 mg/m ³ Nitrogen dioxide (NO2)	0.00 Vol%	0.00 Vol%
20 mg/m ³ Ammonia (NH3)	0.00 Vol%	-0.20 Vol%
200 mg/m ³ Sulfur dioxide (SO2)	0.00 Vol%	0.00 Vol%
1000 mg/m ³ Sulfur dioxide (SO2)	0.00 Vol%	0.00 Vol%
50 mg/m ³ Hydrogen chloride (HCl)	0.00 Vol%	0.00 Vol%
200 mg/m ³ Hydrogen chloride (HCl)	0.00 Vol%	-0.20 Vol%
Sum of the positive cross-sensitivities	0.80 Vol% ⁸⁾	0.76 Vol% ⁹⁾
Sum of the negative cross-sensitivities	-0.20 Vol% ⁸⁾	-0.76 Vol% ⁹⁾

8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	H2O
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

Zero point		Span point	
0.640	Vol%	0.640	Vol%
-1.040	Vol%	0.000	Vol%
0.000	Vol%	1.160	Vol%
0.120	Vol%	0.480	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	-0.040	Vol%
0.080	Vol%	0.000	Vol%
0.800	Vol%	0.760	Vol%
0.060	Vol%	0.060	Vol%
0.392	Vol%	0.392	Vol%
0.560	Vol%	0.560	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	0.370	Vol%
Zero drift from the field test	$u_{d,z}$	=	-0.600	Vol%
Span drift from the field test	$u_{d,s}$	=	0.000	Vol%
Influence of ambient temperature at span point	u_t	=	0.069	Vol%
Influence of sample gas pressure	u_p	=	0.000	Vol%
Influence of sample gas flow	u_f	=	0.000	Vol%
Influence of voltage	u_v	=	0.046	Vol%
Cross-sensitivity	u_i	=	0.462	Vol%
Repeatability at span point	u_r	=	0.035	Vol%
Standard deviation from paired measurements under field conditions	u_D	=	0.227	Vol%
Uncertainty of provided reference material	u_{rm}	=	0.323	Vol%
Misalignment	u_{mb}	=	0.000	Vol%
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000	Vol%
Changes of response factors	u_{rf}	=	0.000	Vol%

Standard uncertainty

Zero point		Span point	
0.370	Vol%	0.370	Vol%
-0.600	Vol%	0.000	Vol%
0.000	Vol%	0.670	Vol%
0.069	Vol%	0.277	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	-0.023	Vol%
0.046	Vol%	0.000	Vol%
0.462	Vol%	0.439	Vol%
0.035	Vol%	0.035	Vol%
0.227	Vol%	0.227	Vol%
0.323	Vol%	0.323	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		0.934 Vol%	1.005 Vol%

Verification of compliance with the requirements

Combined standard uncertainty	1.18	Vol%	according to EN 15267-3
Expanded uncertainty	2.31	Vol%	according to EN 15267-3
Relative expanded uncertainty	5.79	%	of the measuring range of 40 Vol%
Allowed expanded uncertainty	7.50	%	of the measuring range of 40 Vol%
Allowed expanded uncertainty	3.00	Vol%	

Result

Requirements fulfilled

Attention: The 2010/75/EU, 2001/80/EC and 2000/76/EC gives no requirements for these components.

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	O2

Input values

Measuring range	21	Vol%	
Measuring range	21	Vol%	
Confidence interval	10	%	⁷⁾

⁷⁾ Attention: The 2010/75/EU, 2001/80/EC and 2000/76/EC gives no requirements for these components

General information

Maintenance interval	4 weeks	Detection limit	0.03 Vol%
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Calculation of the expanded uncertainty

Interferent	Zero point		Span point	
3 Vol% Oxygen (O2)				
21 Vol% Oxygen (O2)				
30 Vol% Water (H2O)	0.00	Vol%	0.00	Vol%
300 mg/m ³ Carbon monoxide (CO)	0.00	Vol%	0.00	Vol%
15 Vol% Carbon dioxide (CO2)	0.00	Vol%	0.00	Vol%
50 mg/m ³ Methane (CH4)	0.00	Vol%	0.00	Vol%
20 mg/m ³ Dinitrogen oxide (N2O)	0.00	Vol%	0.00	Vol%
100 mg/m ³ Dinitrogen oxide (N2O)	0.00	Vol%	0.00	Vol%
300 mg/m ³ Nitrogen monoxide (NO)	0.00	Vol%	0.00	Vol%
30 mg/m ³ Nitrogen dioxide (NO2)	0.00	Vol%	0.00	Vol%
20 mg/m ³ Ammonia (NH3)	0.00	Vol%	0.00	Vol%
200 mg/m ³ Sulfur dioxide (SO2)	0.00	Vol%	0.00	Vol%
1000 mg/m ³ Sulfur dioxide (SO2)	0.00	Vol%	0.00	Vol%
50 mg/m ³ Hydrogen chloride (HCl)	0.00	Vol%	0.00	Vol%
200 mg/m ³ Hydrogen chloride (HCl)	0.00	Vol%	0.00	Vol%
Sum of the positive cross-sensitivities	0.00 Vol% ⁸⁾		0.00 Vol% ⁹⁾	
Sum of the negative cross-sensitivities	0.00 Vol% ⁸⁾		0.00 Vol% ⁹⁾	

⁸⁾, ⁹⁾ The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	O2
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

Zero point		Span point	
-0.140	Vol%	-0.140	Vol%
0.180	Vol%	0.000	Vol%
0.000	Vol%	-0.200	Vol%
0.020	Vol%	0.240	Vol%
0.000	Vol%	0.000	Vol%
-0.020	Vol%	0.010	Vol%
0.010	Vol%	-0.100	Vol%
0.000	Vol%	0.000	Vol%
0.010	Vol%	0.010	Vol%
0.092	Vol%	0.092	Vol%
0.294	Vol%	0.294	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	-0.081	Vol%
Zero drift from the field test	$u_{d,z}$	=	0.104	Vol%
Span drift from the field test	$u_{d,s}$	=	0.000	Vol%
Influence of ambient temperature at span point	u_t	=	0.012	Vol%
Influence of sample gas pressure	u_p	=	0.000	Vol%
Influence of sample gas flow	u_f	=	-0.012	Vol%
Influence of voltage	u_v	=	0.006	Vol%
Cross-sensitivity	u_i	=	0.000	Vol%
Repeatability at span point	u_r	=	0.006	Vol%
Standard deviation from paired measurements under field conditions	u_D	=	0.053	Vol%
Uncertainty of provided reference material	u_{rm}	=	0.170	Vol%
Misalignment	u_{mb}	=	0.000	Vol%
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000	Vol%
Changes of response factors	u_{rf}	=	0.000	Vol%

Standard uncertainty

Zero point		Span point	
-0.081	Vol%	-0.081	Vol%
0.104	Vol%	0.000	Vol%
0.000	Vol%	-0.115	Vol%
0.012	Vol%	0.139	Vol%
0.000	Vol%	0.000	Vol%
-0.012	Vol%	0.006	Vol%
0.006	Vol%	-0.058	Vol%
0.000	Vol%	0.000	Vol%
0.006	Vol%	0.006	Vol%
0.053	Vol%	0.053	Vol%
0.170	Vol%	0.170	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%
0.000	Vol%	0.000	Vol%

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		0.222 Vol%	0.272 Vol%

Verification of compliance with the requirements

Combined standard uncertainty	0.29	Vol%	according to EN 15267-3
Expanded uncertainty	0.57	Vol%	according to EN 15267-3
Relative expanded uncertainty	2.72	%	of the measuring range of 21 Vol%
Allowed expanded uncertainty	7.50	%	of the measuring range of 21 Vol%
Allowed expanded uncertainty	1.58	Vol%	

Result

Requirements fulfilled

Attention: The 2010/75/EU, 2001/80/EC and 2000/76/EC gives no requirements for these components.

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version 6.2

Device data

Customer	GXA / Grecian-Magnesite Greece		
Identification	K9-23-040		
Serial number	2335 2279	Date	2023-09-14
Measuring system	MCS100FT	Component	TOC

Input values

Measuring range	15	mg/m ³
Emissions limit value	15	mg/m ³
Confidence interval	30	%

General information

Maintenance interval	2	months	Detection limit	0	mg/m ³
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Calculation of the expanded uncertainty

Interferent

3 Vol% Oxygen (O2)
21 Vol% Oxygen (O2)
30 Vol% Water (H2O)
300 mg/m ³ Carbon monoxide (CO)
15 Vol% Carbon dioxide (CO2)
50 mg/m ³ Methane (CH4)
20 mg/m ³ Dinitrogen oxide (N2O)
100 mg/m ³ Dinitrogen oxide (N2O)
300 mg/m ³ Nitrogen monoxide (NO)
30 mg/m ³ Nitrogen dioxide (NO2)
20 mg/m ³ Ammonia (NH3)
200 mg/m ³ Sulfur dioxide (SO2)
1000 mg/m ³ Sulfur dioxide (SO2)
50 mg/m ³ Hydrogen chloride (HCl)
200 mg/m ³ Hydrogen chloride (HCl)

Zero point

0.00	mg/m ³
0.00	mg/m ³
0.17	mg/m ³
0.00	mg/m ³
0.13	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.08	mg/m ³
0.08	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.08	mg/m ³

Span point

0.00	mg/m ³
0.00	mg/m ³
0.18	mg/m ³
0.00	mg/m ³
-0.15	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
0.00	mg/m ³
-0.08	mg/m ³
0.00	mg/m ³
0.09	mg/m ³

Sum of the positive cross-sensitivities

0.54 mg/m³ ⁸⁾

0.27 mg/m³ ⁹⁾

Sum of the negative cross-sensitivities

0.00 mg/m³ ⁸⁾

-0.23 mg/m³ ⁹⁾

8), 9) The larger absolute value is used for further calculations

Calculation of measurement uncertainty

According to EN 15267-3, EN 14181 and EN ISO 14956

Version

Device data

Customer	GXA / Grecian-Magnesite Greece	Date	2023-09-14
Identification	K9-23-040	Component	TOC
Serial number	2335 2279		
Measuring system	MCS100FT		

Influences of the process characteristics

Process characteristics

Lack-of-fit (Linearity)	
Zero drift from the field test	
Span drift from the field test	
Influence of ambient temperature at span point	
Influence of sample gas pressure	
Influence of sample gas flow	
Influence of voltage	
Cross-sensitivity	
Repeatability at span point	
Standard deviation from paired measurements under field conditions	
Uncertainty of provided reference material	
Misalignment	
Conversion rate of AMS for measurement of NOx	
Changes of response factors	

Largest difference according to type approval

	Zero point	Span point
	0.101 mg/m ³	0.101 mg/m ³
	0.263 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.422 mg/m ³
	0.210 mg/m ³	-0.195 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.090 mg/m ³	-0.105 mg/m ³
	-0.015 mg/m ³	0.075 mg/m ³
	0.539 mg/m ³	0.270 mg/m ³
	0.010 mg/m ³	0.010 mg/m ³
	0.046 mg/m ³	0.046 mg/m ³
	0.210 mg/m ³	0.210 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.980 mg/m ³	0.980 mg/m ³

Process characteristics

Lack-of-fit (Linearity)	u_{lof}	=	0.058 mg/m ³
Zero drift from the field test	$u_{d,z}$	=	0.152 mg/m ³
Span drift from the field test	$u_{d,s}$	=	0.000 mg/m ³
Influence of ambient temperature at span point	u_t	=	0.121 mg/m ³
Influence of sample gas pressure	u_p	=	0.000 mg/m ³
Influence of sample gas flow	u_f	=	0.052 mg/m ³
Influence of voltage	u_v	=	-0.009 mg/m ³
Cross-sensitivity	u_i	=	0.311 mg/m ³
Repeatability at span point	u_r	=	0.006 mg/m ³ ¹⁰⁾
Standard deviation from paired measurements under field conditions	u_D	=	0.026 mg/m ³ ¹⁰⁾
Uncertainty of provided reference material	u_{rm}	=	0.121 mg/m ³
Misalignment	u_{mb}	=	0.000 mg/m ³
Conversion rate of AMS for measurement of NOx	u_{ce}	=	0.000 mg/m ³
Changes of response factors	u_{rf}	=	0.566 mg/m ³

Standard uncertainty

	Zero point	Span point
	0.058 mg/m ³	0.058 mg/m ³
	0.152 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	-0.243 mg/m ³
	0.121 mg/m ³	-0.113 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.052 mg/m ³	-0.061 mg/m ³
	-0.009 mg/m ³	0.043 mg/m ³
	0.311 mg/m ³	0.156 mg/m ³
	0.006 mg/m ³ ¹⁰⁾	0.006 mg/m ³ ¹¹⁾
	0.026 mg/m ³ ¹⁰⁾	0.026 mg/m ³ ¹¹⁾
	0.121 mg/m ³	0.121 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.000 mg/m ³	0.000 mg/m ³
	0.566 mg/m ³	0.566 mg/m ³

10), 11) For calculation of the combined standard uncertainty only the larger value is used

Calculation of the combined standard uncertainties

Combined standard uncertainty	s(AMS) values	Zero point	Span point
		0.6897 mg/m ³	0.6636 mg/m ³

Verification of compliance with the requirements

Combined standard uncertainty	0.733 mg/m ³	according to EN 15267-3
Expanded uncertainty	1.437 mg/m ³	according to EN 15267-3
Relative expanded uncertainty	9.58 %	of the emissions limit value of 15 mg/m ³
Allowed expanded uncertainty	22.50 %	of the emissions limit value of 15 mg/m ³
Allowed expanded uncertainty	3.375 mg/m ³	

Result

Requirements fulfilled