TÜV

TÜV Rheinland Group

CERTIFICATE

die TÜV Immissionsschutz und Energiesysteme GmbH TÜV Rheinland Group

The Measurement System

Manufacturer:	Mess- und Analysentechnik GmbH
Emission Measuring System:	**Thermo-FID**
Test Report:	936/806016 from 26.02.1997 936/806016/B from 23.12.2003

fulfils the requirements of the QAL 1

for the component:
Total-Organic-Carbon

according to EN 14181 und EN ISO 14956.

Cologne, 21. Juli 2005

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Deutscher Akkreditierungs Rat
DAR
DAP-PL-3856.99

DIN EN ISO 14956 Berechnung für die QAL 1 nach DIN EN 14181

Manufacturer Data

Manufacturer	Mess- und Analysentechnik GmbH
Measurement System	Gas measuring device
Name	Thermo-FID
Serial Number	3300196, 3300796, 3300496
Measuring Principle	FID

TÜV Data

TÜV Report	936 / 806016
Date	21.07.2005
Editor	Fr. Hamacher

Measurement Component TOC 15 mg/m³

Evaluation of the cross sensitivity (CS)

	CS $X_{max,j}$
to 3 Vol.-% Oxygen	-0,53 mg/m³
to 21 Vol.-% Oxygen	0,00 mg/m³
to 30 Vol.-% Humidity	0,00 mg/m³
to 300 mg/m³ Carbon monoxide	0,16 mg/m³
to 15 Vol.-% Carbon dioxide	0,00 mg/m³
to 50 mg/m³ Methane	0,00 mg/m³
to 20 mg/m³ Dinitrogen monoxide	0,10 mg/m³
to 100 mg/m³ Dinitrogen oxide	0,00 mg/m³
to 300 mg/m³ Nitrogen monoxide	0,00 mg/m³
to 30 mg/m³ Nitrogen dioxide	0,00 mg/m³
to 20 mg/m³ Ammonia	0,00 mg/m³
to 200 mg/m³ Sulphur dioxide	0,00 mg/m³
to 1000 mg/m³ Sulphur dioxide	-0,14 mg/m³
to 50 mg/m³ Hydrogen chloride	0,00 mg/m³
to 200 mg/m³ Hydrogen chloride	0,00 mg/m³
Sum of positive cross sensitivities	0,26 mg/m³
Sum of negative cross sensitivities	-0,67 mg/m³

Calculation of the combined standard uncertainty

Test Value		$\Delta X_{max,j}$	$u(\Delta X_{max,j}) = \frac{\Delta X}{\sqrt{3}}$	$u(\Delta X_{max,j})^2$
Lack of fit	u_L	0,06 mg/m³	0,03 mg/m³	0,001
Interference	u_I	0,26 mg/m³	-0,38 mg/m³	0,148
Span shift in the field test	$u_{d,s}$	0,26 mg/m³	0,15 mg/m³	0,022
Zero shift in the field test	$u_{d,z}$	0,23 mg/m³	0,13 mg/m³	0,017
Sensitivity to sample volume flow	u_v	0,00 mg/m³	0,00 mg/m³	0,000
Sensitivity to sample pressure	u_{sp}	0,00 mg/m³	0,00 mg/m³	0,000
Sensitivity to sample temperature	u_{st}	0,00 mg/m³	0,00 mg/m³	0,000
Sensitivity to ambient temperature	u_t	0,70 mg/m³	0,40 mg/m³	0,164
Repeatability at zero	u_z	0,39 mg/m³	0,23 mg/m³	0,051
Repeatability at span	u_r	0,00 mg/m³	0,00 mg/m³	0,000
Dependence on supply voltage	usv	0,00 mg/m³	0,00 mg/m³	0,000
Field reproducibility	uD	0,17 mg/m³	0,10 mg/m³	0,009
NOx converter efficiency adjustment	u_{NOx}	0,00 mg/m³	0,00 mg/m³	0,000
Variation of response factors (TOC)	$u_{R,TOC}$	2,27 mg/m³	1,31 mg/m³	1,710
Excursion of measurement beam	u_{mb}	0,00 mg/m³	0,00 mg/m³	0,000
Combined standard uncertainty (u_C)	u_c	$u_c = \sqrt{\Sigma(u_{max,j})^2}$		1,456
Total expanded uncertainty	(u_c * k)	$U_c = u_c * 1,96$		2,855
Relative total expanded uncertainty		*Uc in % of the limit 10 mg/m³*		28,5
Requirement		Uc in % of the limit 10 mg/m³		30,0

Result: Fulfils the requirements for QAL 1 of EN 14181