

CERTIFICATE

die TÜV Immissionsschutz und
Energiesysteme GmbH
TÜV Rheinland Group

The Measurement System

Manufacturer:	Mess- und Analysetechnik 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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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/m ³
to 21 Vol.-% Oxygen	0,00	mg/m ³
to 30 Vol.-% Humidity	0,00	mg/m ³
to 300 mg/m ³ Carbon monoxide	0,16	mg/m ³
to 15 Vol.-% Carbon dioxide	0,00	mg/m ³
to 50 mg/m ³ Methane	0,00	mg/m ³
to 20 mg/m ³ Dinitrogen monoxide	0,10	mg/m ³
to 100 mg/m ³ Dinitrogen oxide	0,00	mg/m ³
to 300 mg/m ³ Nitrogen monoxide	0,00	mg/m ³
to 30 mg/m ³ Nitrogen dioxide	0,00	mg/m ³
to 20 mg/m ³ Ammonia	0,00	mg/m ³
to 200 mg/m ³ Sulphur dioxide	0,00	mg/m ³
to 1000 mg/m ³ Sulphur dioxide	-0,14	mg/m ³
to 50 mg/m ³ Hydrogen chloride	0,00	mg/m ³
to 200 mg/m ³ Hydrogen chloride	0,00	mg/m ³
Sum of positive cross sensitivities	0,26	mg/m ³
Sum of negative cross sensitivities	-0,67	mg/m ³

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/m ³	0,03 mg/m ³	0,001
Interference	u _I	0,26 mg/m ³	-0,38 mg/m ³	0,148
Span shift in the field test	u _{d,s}	0,26 mg/m ³	0,15 mg/m ³	0,022
Zero shift in the field test	u _{d,z}	0,23 mg/m ³	0,13 mg/m ³	0,017
Sensitivity to sample volume flow	u _v	0,00 mg/m ³	0,00 mg/m ³	0,000
Sensitivity to sample pressure	u _{sp}	0,00 mg/m ³	0,00 mg/m ³	0,000
Sensitivity to sample temperature	u _{st}	0,00 mg/m ³	0,00 mg/m ³	0,000
Sensitivity to ambient temperature	u _t	0,70 mg/m ³	0,40 mg/m ³	0,164
Repeatability at zero	u _z	0,39 mg/m ³	0,23 mg/m ³	0,051
Repeatability at span	u _r	0,00 mg/m ³	0,00 mg/m ³	0,000
Dependence on supply voltage	u _{sv}	0,00 mg/m ³	0,00 mg/m ³	0,000
Field reproducibility	u _D	0,17 mg/m ³	0,10 mg/m ³	0,009
NOx converter efficiency adjustment	u _{NOx}	0,00 mg/m ³	0,00 mg/m ³	0,000
Variation of response factors (TOC)	u _{R, TOC}	2,27 mg/m ³	1,31 mg/m ³	1,710
Excursion of measurement beam	u _{mb}	0,00 mg/m ³	0,00 mg/m ³	0,000
Combined standard uncertainty (u _c)	u _c	$u_c = \sqrt{\sum(u_{max,j})^2}$		1,456
Total expanded uncertainty	(u _c * k)	U _c = u _c * 1,96		2,855
Relative total expanded uncertainty		U _c in % of the limit 10 mg/m ³		28,5
Requirement		U _c in % of the limit 10 mg/m ³		30,0

Result: Fulfils the requirements for QAL 1 of EN 14181