Appendix F1: Treatment, Abatement and Control for Emission A2-1

TABLE F.1 (A2-1): ABATEMENT / TREATMENT CONTROL
Emission point reference number *: A2-1*

Control parameter	Equipment	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out	Monitoring Equipment	Monitoring Equipment Calibration
NO_x (as NO_2)	SNCR reagent injection in post combustion chamber	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Appropriate spare parts, two stage injection with redundant third level, ammonia solution storage capacity	Continuous	ABB Cemas multi-component FTIR analyser or similar	As per supplier recommendation and licence requirement
Dust	Furnace, baghouse filter	As above	As above	Appropriate spare parts e.g. filter bags. Redundancy built into baghouse filter so one module can be bypassed if required.	Continuous	SIGRIST photometer or similar	As above
SO_2	Lime injections in spray drier absorber and reaction duct, baghouse filter	As above	As above	Appropriate spare parts, regulated two stage lime injections, redundancy in lime injection, lime slurry storage capacity	Continuous	ABB Cemas multi-component FTIR analyser or similar	As above
HCl	Lime injections in spray drier absorber and reaction duct, baghouse filter	As above	As above	Appropriate spare parts, regulated two stage lime injections, redundancy in lime injection, lime slurry storage capacity	Continuous	ABB Cemas multi-component FTIR analyser or similar	As above
HF	Lime injections in spray drier absorber and reaction duct, baghouse filter	As above	As above	Appropriate spare parts, regulated two stage lime injections, redundancy in lime injection, lime slurry storage capacity	Continuous	ABB Cemas multi-component FTIR analyser or similar	As above

Control parameter	Equipment	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out	Monitoring Equipment	Monitoring Equipment Calibration
PCDD/F	Expanded clay and activated carbon injections, baghouse filter	As above	As above	Appropriate spare parts including e.g. filter bags. Redundancy built into baghouse filter so one module can be bypassed if required. Two stage removal with expanded clay and activated carbon	Continuous sampling with approximately 20 samples analysed per year as well as biannual sample taken over 6 to 8 hour period	AMESA dioxin monitor or similar. Sampling and analysis in accredited laboratory	As above
Heavy metals[1], Cd & Tl, Hg	Expanded clay and activated carbon injections, baghouse filter	As above	As above	Appropriate spare parts including e.g. filter bags. Redundancy built into baghouse filter so one module can be bypassed if required. Two stage removal with expanded clay and activated carbon	Quarterly	Sampling and analysis by accredited laboratory	As above
TOC	Combustion control system	As above	As above	Appropriate spare parts and redundant key components	Continuous	ABB Cemas multi-component FTIR analyser or similar	As above
CO	Combustion control system	As above	As above	Appropriate spare parts and redundant key components	Continuous	ABB Cemas multi-component FTIR analyser or similar	As above

[1] Heavy metals includes Sb + As + Pb + Cr + Co + Mn + Ni + V

Appendix F2: Treatment, Abatement and Control for Emission A2-2

TABLE F.1 (A2-2): ABATEMENT / TREATMENT CONTROL
Emission point reference number *: A2-2*

Control parameter	Equipment	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out	Monitoring Equipment	Monitoring Equipment Calibration
CO	Combustion control system	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Appropriate spare parts	Once during commissioning tests[2], regular generator testing	Sampling and analysis by accredited laboratory	As per procedures of accredited laboratory
NO_x	As above	As above	As above	As above	As above	As above	As above
TOC	As above	As above	As above	As above	As above	As above	As above
Dust	As above	As above	As above	As above	As above	As above	As above

[2] Emissions from the emergency generator will only require testing once, during commissioning, as outlined in Attachment F.2.1

Appendix F3: Treatment, Abatement and Control for Emission SW1

TABLE F.1 (SW1): ABATEMENT / TREATMENT CONTROL
Emission point reference number *: SW1*

Control parameter	Equipment	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out	Monitoring Equipment	Monitoring Equipment Calibration
TOC	Diversion of emission to contaminated water diversion tank for recirculation or removal from site	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Two monitoring locations, appropriate spare parts	Continuous	Individual monitor or multi-component analyser	As per supplier recommendation and licence requirement
pH	As above	As above	As above	As above	As above	As above	As above
Conductivity	As above	As above	As above	As above	As above	As above	As above
Temperature	As above	As above	As above	As above	As above	As above	As above
Flow	As above	As above	As above	As above	As above	As above	As above

Appendix F4: Treatment, Abatement and Control for Emission GW1

TABLE F.1 (GW1): ABATEMENT / TREATMENT CONTROL
Emission point reference number *: GW1*

Control parameter	Equipment	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out	Monitoring Equipment	Monitoring Equipment Calibration
Biological Oxygen Demand (BOD)	Biofibrous media containing modules in Puraflow system[3]	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Appropriate spare parts	Quarterly	Sampling and analysis by accredited laboratory	Where necessary as per supplier recommendation and licence requirement
Chemical Oxygen Demand (COD)	As above	As above	As above	As above	Quarterly	As above	As above
Total Suspended Solids (TSS)	As above	As above	As above	As above	Quarterly	As above	As above

[3] See Attachment D.1.k for details of Puraflo system

Appendix F5: Monitoring and Sampling for Emission A2-1

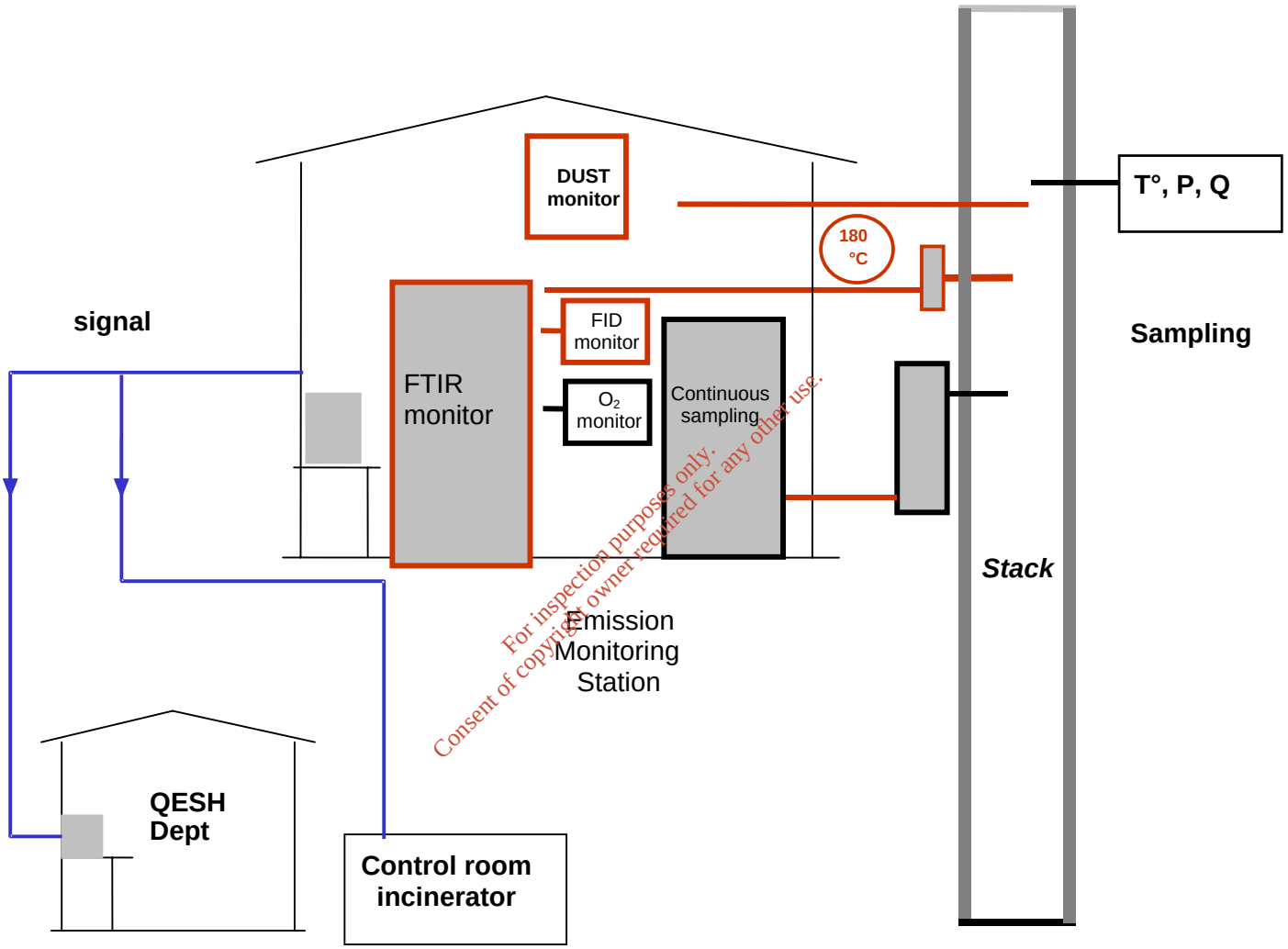
TABLE F.2 (A2-1) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per media)

Emission Point Reference No(s). : A2-1

Parameter	Monitoring frequency[4]	Accessibility of Sampling Points
NO_x (as NO_2)	Continuous	The sampling points will be located at a high level on the stack connecting to the monitoring equipment located at ground level. Both points and equipment will be located within the main process building and will be accessible at all times by internal grate walkways.
Dust	Continuous	As above
SO_2	Continuous	As above
HCl	Continuous	As above
HF	Continuous	As above
PCDD/F	Continuous sampling with analysis every 2 weeks as well as bi-annual sample taken over 6 – 8 hour period	As above
Heavy metals[5], Cd & Tl, Hg	Quarterly	As above
TOC	Continuous	As above
CO	Continuous	As above

[4] All monitoring and sampling periods will be in line with EU Directive 2000/76/EC
[5] Heavy metals includes Sb + As + Pb + Cr + Co + Mn + Ni + V

Appendix F6: Diagram of Typical Stack Monitoring Station



Appendix F7: AMESA Monitoring System Brochure

AMESA

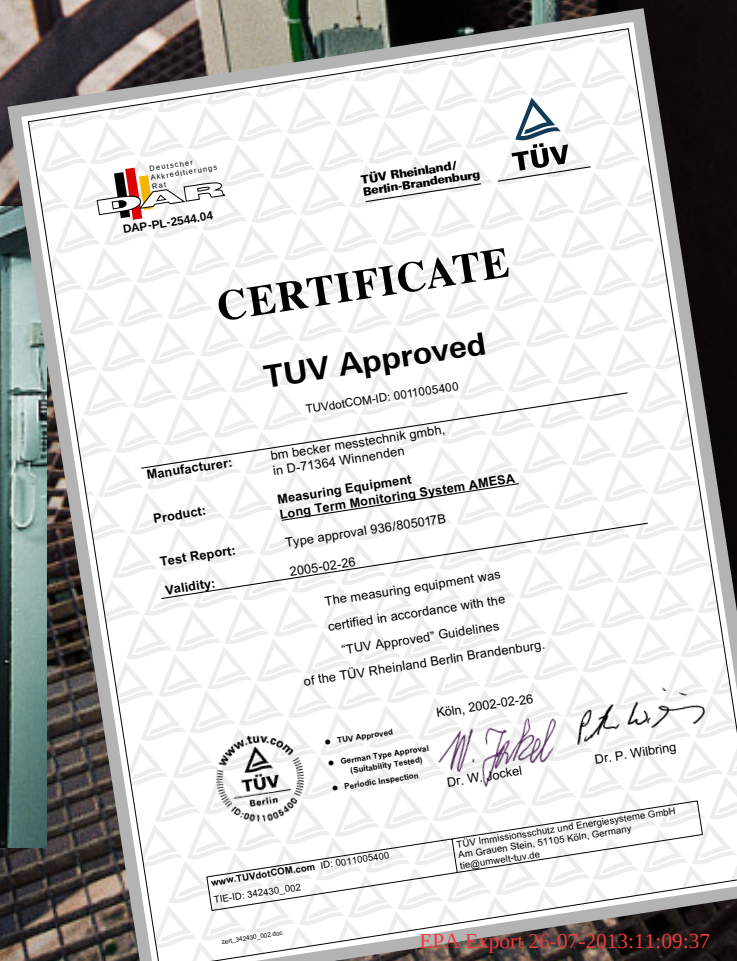
bm becker messtechnik

(Adsorption Method for Sampling of Dioxins and Furans)

Continuous dioxin-/furan-monitoring by long-term sampling, by using the first certified dioxin-/furan-monitoring-system for plants which have to be approved and are subject to the German environmental regulation 17. BImSchV.

Complies with US EPA method 23A (optional)

Approved by the German Technical Inspection Authority (TÜV)



Deutscher Akkreditierungs Rat
DAP-PL-2544.04

TÜV Rheinland/ Berlin-Brandenburg

TÜV

CERTIFICATE

TUV Approved

TUVdotCOM-ID: 0011005400

Manufacturer: bm becker messtechnik gmbh, in D-71364 Winnenden

Product: Measuring Equipment Long Term Monitoring System AMESA

Test Report: Type approval 936/805017B

Validity: 2005-02-26

The measuring equipment was certified in accordance with the "TUV Approved" Guidelines of the TÜV Rheinland Berlin Brandenburg.

Köln, 2002-02-26

Dr. W. Jockel

Dr. P. Wilbring

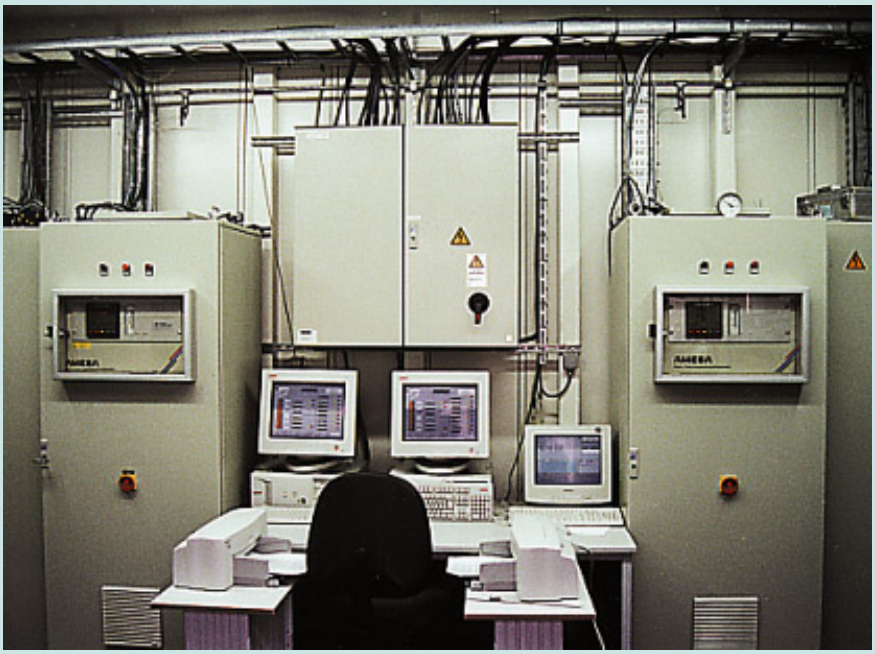
www.tuv.com TÜV Berlin ID: 0011005400

- TUV Approved
- German Type Approval (Suitability Tested)
- Periodic Inspection

www.TUVdotCOM.com ID: 0011005400
TIE-ID: 342430_002

TÜV Immissionsschutz und Energiesysteme GmbH
Am Grauen Stein, 51105 Köln, Germany
tie@umwelt-tuv.de

zert_342430_002.doc



AMESA® control cabinets for monitoring 2 lines simultaneously

Application

The continuous monitoring of dioxin and furan emissions of incinerators is a topic which has been discussed globally over the last several years. Even though a continuous on-line monitoring system would be the optimum solution, such systems are not yet available. Therefore, long-term sampling using AMESA® could close the gap between reality and target results. AMESA® provides more information on dioxin emissions than the usual short-term collection of samples over a few hours on 1 – 3 selected days per year.

The officially approved AMESA® monitoring system is used for measuring dioxin/furan emissions in plants which have to be approved and are subject to the 17. BImSchV and TA Luft.

The AMESA® can be used, for example, in refuse incinerators, hazardous material incinerators, plants for the production of iron, steel and non-ferrous metals as well as metal recycling plants. In these plants the AMESA® helps determine the production and retention rates and measures emissions before and after various flue gas cleaning systems, such as, for example:

- Activated charcoal filters (different types), e.g. for monitoring PCDF/D retention rate
- Dry electrostatic precipitators
- Wet electrostatic precipitators
- Dust cyclones
- Spray absorbers
- Wet scrubbers
- Fabric filters (with and without prior injection of solids containing activated charcoal)
- Flue stream reactors
- Catalytic converters.

Furthermore, the AMESA® is used for the following applications:

- Monitoring and optimizing the built-in dioxin reduction stages
- Monitoring the possibility of using other fuels, e. g. in refuse incineration
- Monitoring starting and shut-down procedures in furnaces
- Checking memory effects

becker messtechnik

Outdoor-installation on the stack

Special Features

- Uses the well-known adsorption method
- Continuous automatic measurement
- Fully automatic recording and taking of mixed sample over a period of up to 30 days
- Guaranteeing continuous emission monitoring in respect of dioxins and furans (only 10 – 15 minutes interruption during each cartridge change)
- Information on monthly mean value of dioxin/furan emissions by analysis of mixed sample (XAD-II cartridge) in laboratory
- Additonal information on flue gas velocity, sample gas flow volume, flue gas temperature and cartridge temperature as half-hourly average. Optionally up to 4 informations like e.g. O_2, CO_2, CO, HCl, dust etc. can be recorded and saved as half-hourly average
- **No collection of condensate** and none of the associated handling problems during monitoring over long periods
- Broadly based measuring range for dioxin/furan concentrations between 0.0001 and 10 ng/m³ (as TE to NATO CCMS model). The measuring range 0-0,2 ng/m³ is certified.

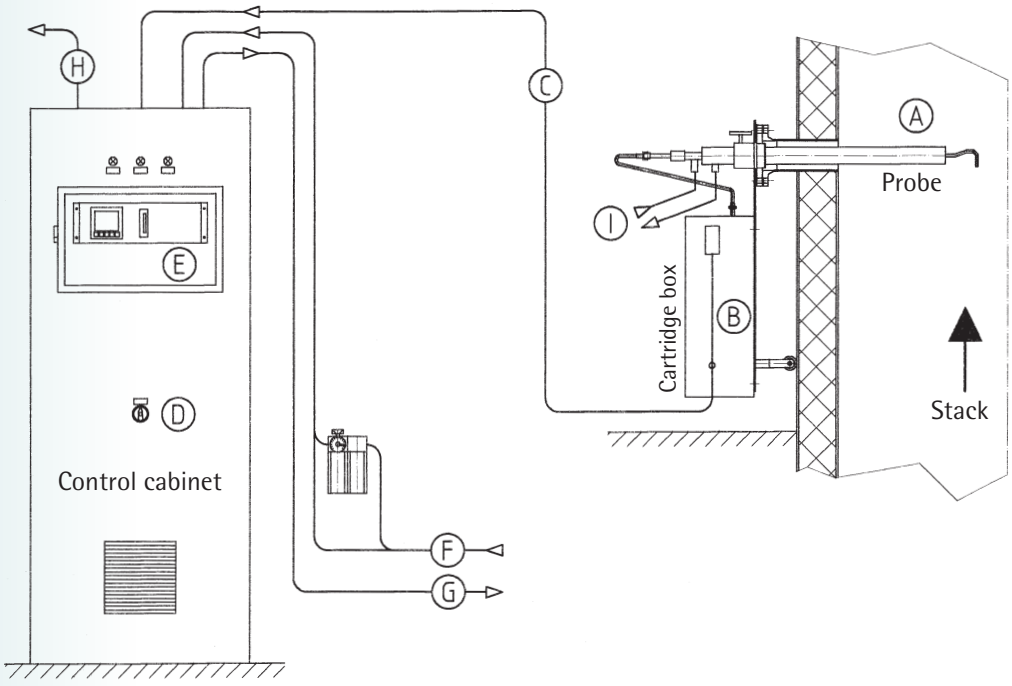
All these features offer plant operators the following benefits:

- Reduced running costs by minimizing the use of additives
- Reduced costs by optimizing the built-in dioxin reduction stages
- Minimizing running and maintenance costs by monitoring the reduction in furnace temperature
- Better utilization of plant capacity by using other possible fuels (e. g. in refuse incineration)
- Achieving a "transparent flue" and the environmental acceptance that goes with it

Functional Principle

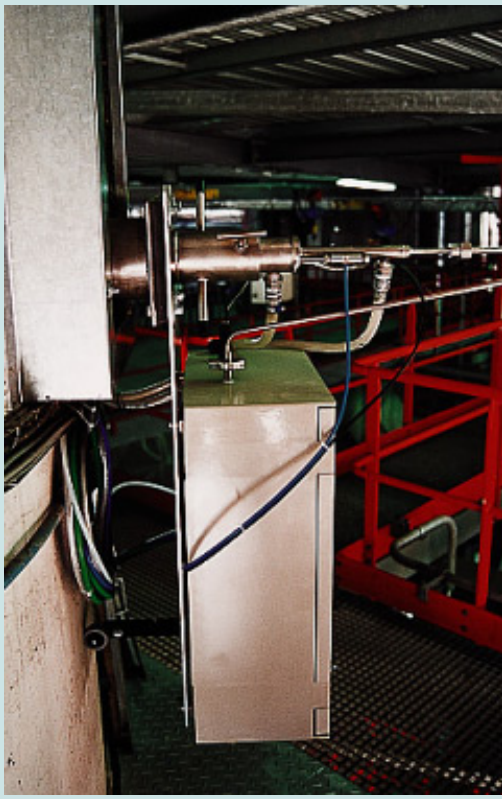
The dioxin/furan monitoring system AMESA® extracts a volume stream constantly and isokinetically from flue gas. Dioxins and furans are collected on a cartridge filled with adsorber resin (Functional principle XAD II). In 1993 this adsorption method was the first and only method, which was accepted official by the german authorities to be suitable to control the dioxin emission limit value of 0,1 ng ITE/m³.
AMESA® operates fully automatically and stores all necessary data both internally and on a removable SRAM card.

Cartridge box incl. the XAD-II-cartridge



The dioxins and furans (PCDD/PCDF) are collected in the adsorption cartridge over a variable period between 6 hours and 4 weeks. To determine the quantity of the collected dioxins and furans the cartridge and the SRAM memory card has to be analysed by a laboratory which is familiar with the analysis of PCDD/PCDF-adsorber cartridges.

AMESA® control, including SRAM card drive



Sampling probe with cartridge case mounted on stack

(A) Cooled (< 70°C) titanium probe for isokinetic extraction of a volume stream.

(B) Measurement stream and condensate are drawn through the cartridge filled with adsorber resin (quartz wool as a prefilter).

(C) Measurement stream and condensate are drawn through the measuring gas line to the control cabinet.

(D) Control cabinet with separation of the condensate by cooling (< 5°C) and infinitely variable control of the isokinetical extraction.

(E) User-friendly operation of AMESA® by menu dialogue in process controller. Data input for plant specific parameters and operation by means of keyboard and LCD-monitor. Analysis of the emission values by means of SRAM memory chip and analysis results.

(F) Compressed air, power supply and input signal conduits.

(G) Condensate drain and flue gas recycling

(H) Signal output (optional)

(I) Coolant connection (if $T_{Fluegas}$ > 70 °C)

AMESA

Certificates

In 1997, the patented AMESA® system successfully passed a type performance test carried out by TÜV Rheinland (No.: 936/808017A 12. 8.1997) in accordance with the minimum requirements for long-term sampling systems. Therefore AMESA® was published in the Joint Ministerial Gazette (GMBI, 13 January 1998, page 10) issued by the Federal Ministry of the Environment, Conservation and Reactor Safety (BMU).

This test formed the basis for the development of the minimum requirements for long-term sampling systems, which were published by the German Ministry of Evironmental in the Joint Ministerial Gazette (GMBI, 15 September 1998, page 552) and were notified by the European Union (EU notification 97/26/D).

DAP-PL-2544.04

TÜV Rheinland Berlin Brandenburg

CONFIRMATION

Federal Ministry
for environment, nature conservation and reactor safety (BMU)

Concerted practice
in checking of the emissions and the ambient air
circular letter by BMU of the 1997-12-30 - IG I 3 - 51134/2 –
GMBl 1998, no. 1, page 10

IV. Communication about long-term sampling systems

Following number 3 of the guideline about the suitability test, the mounting, the inspection and the maintenance of measuring equipment for the continuous check of the emissions for special substances (here: System for long-term sampling), GMBl. In 1995, p. 128 ff. - IG I 3 - 511 134/2 -, of the Federal Ministry's for environment, nature conservation and reactor safety is announced the following:

1. AMESA for Dioxins / Furans

Manufacturer:
- Becker Meßtechnik GmbH, Winnenden
- Gesellschaft für Arbeitsplatz und Umweltanalytik mbH, Münster-Roxel

Operative range:
For measurements agreed upon at plants of the 17th BImSchV and TA Luft.

Range:
0 - 0,2 ng/m³ (TE in accordance with NATO CCMS-Model) for sampling intervals of 6 h to 4 weeks

References:
1. It is a model suitability test, in which the analytic has not corresponded in the full extent with the EN 1948 and the drafts of the guideline VDI 3499 (p. 1 - 3).
2. The AMESA System was operated at sample volume flows of approx. 1 m³/h (0,2 m³/h to 2 m³/h) during the suitability test.
3. During the field test in the exhaust gas the dust concentration was < 3 mg/m³ and the humidity approx. 20 Vol.-%. A maintenance interval of 4 weeks resulted; in the case of other limiting conditions the maintenance interval is to be adapted to the local conditions onsite.

Test report:
TÜV Rheinland Sicherheit und Umweltschutz, Köln,
Nr. 936/808017A of 1997-08-12

Köln, 2002-02-26

Dr. W. Jockel Dr. P. Wilbring

TIE-ID : 342430

TÜV Immissionsschutz und Energiesysteme GmbH
Am Grauen Stein, 51105 Köln
tie@umwelt-tuv.de

Announcement of the suitability test for AMESA®

DAP-PL-2544.04

TÜV Rheinland/ Berlin-Brandenburg

TÜV

CERTIFICATE

TUV Approved

TUVdotCOM-ID: 0011005400

Manufacturer:	bm becker messtechnik gmbh, in D-71364 Winnenden
Product:	**Measuring Equipment** **Long Term Monitoring System AMESA**
Test Report:	Type approval 936/805017B
Validity:	2005-02-26

The measuring equipment was certified in accordance with the "TUV Approved" Guidelines of the TÜV Rheinland Berlin Brandenburg.

Köln, 2002-02-26

www.tuv.com TÜV Berlin ID:0011005400

- TUV Approved
- German Type Approval (Suitability Tested)
- Periodic Inspection

Dr. W. Jockel Dr. P. Wilbring

www.TUVdotCOM.com ID: 0011005400
TIE-ID: 342430_002

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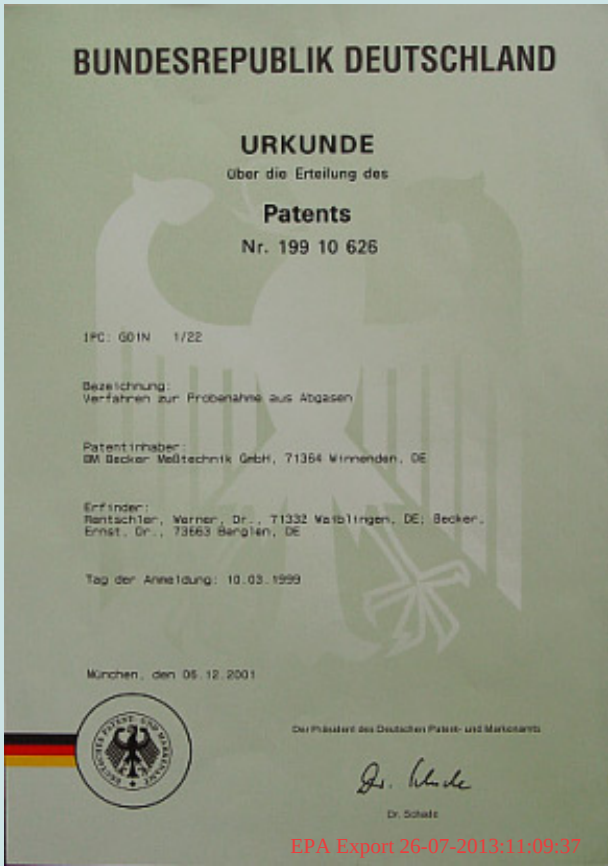
TÜV certificate

In 2002, AMESA® obtained the TÜV approval according to the TUVdotCom regulations (TUVdotCom-ID: 0011005400). To obtain such approval in addition to the performance test, we as manufacturer subject ourselves to an annual inspection through auditors of TÜV Immissionsschutz und Energiesysteme GmbH. This ensures that the actual AMESA® systems produced conform to the minimum requirements set for long-term sampling systems.



BUNDESREPUBLIK DEUTSCHLAND

URKUNDE

über die Erteilung des

Patents

Nr. 199 10 626

IPC: G01N 1/22

Bezeichnung:
Verfahren zur Probenahme aus Abgasen

Patentinhaber:
GM Becker Meßtechnik GmbH, 71364 Winnenden, DE

Erfinder:
Rentschler, Werner, Dr., 71332 Waiblingen, DE; Becker, Ernst, Dr., 73663 Berglen, DE

Tag der Anmeldung: 10.03.1999

München, den 05.12.2001

Der Präsident des Deutschen Patent- und Markenamts

Dr. Schaltz

Patent

The following methods of operation are possible by a long term monitoring with AMESA®:

Method of Operation	Sampling Time	Number of Samplings per Year	Number of Analysis per Year	Description
1	4 Weeks	13	13	Continuous dioxin-/furan-monitoring without interruption for every month (4 weeks) one dioxin/furan analysis is available
2	1 Week	52	variable eg. 5	continuous dioxin/furan monitoring Authority defines when an analysis has to be done in case of interruption a dioxin/furan analysis can be done afterwards the cartridges can be stored 6 months after the sampling (approved by TÜV))
3	Period 4 Weeks active measurement eg. 6 x1 hours/4 Weeks 16x1 hours/4 Weeks	variable eg. 13	Variable eg. 3	Authority/operator defines when a sampling will be started Authority/operator defines when an analysis has to be done
4	6–16 hours	3	3	Measuring time and quantity of samples acc. 17. BImSchV, § 13 (2) (3) The results of the analysis and measuring method of AMESA® are approved in comparison to the filter/cooler method (acc. EN 1948-1 dated 1 May of 1997) by measurements of validity

AMESA

Technical Data

General Data

Measuring range for dioxin / furan	0,0001 – 10ng TE / m3
Sampling interval	6 hours to 4 weeks
Flue gas temperature	up to 70 °C without cooling up to 400°C with cooling
Dust content of flue gas	up to 20 mg/m³
Flue gas velocity	2 – 30 m/s
Ambient conditions	5 – 40°C, max. 50% rel. humidity
Isokinetic control cycle	1 sec
Accuracy of velocity measurement	± 1 % of measuring range
Accuracy of determining volume	± 1,5 % of measuring range
Digital outputs	Status: Monitoring mode, break, fault
Digital inputs	Furnace off, analyser maintenance
Possible analogue inputs	O_2, CO_2, humidity of flue gas, CO, HCl, dust, flue gas velocity or standard or operating flow volume, flue gas temperature static pressure in flue gas duct

Electrical Data

Power supply	230 V, 50 Hz 115 V, 50/60 Hz (optionally)
Fuse	16 A
Power consumption	approx. 1,1 kW

Mechanical Data

Compressed air connection	8×1mm or 6×1mm hose
Compressed air supply	3 to 7 bar, dry, oil-free
Coolant connection	Inlet and return hose ½" Consumption approx. 0.5–5 litres/min (depending on flue gas temperature) Absolutely essential in case of flue gas >70°C

Disposal

Flue gas recycling	8×1mm hose
Condensate drain	8×1mm hose
Condensate quantity	approx. 3 litres/day (depending on flue gas moisture content)

Sampling Probe

Probe length	500 to 2000 mm
Probe shaft diameter	60 mm
Minimum nominal diameter probe connection	DN 100
Clear diameter of probe tip	4, 5, 6 mm
Probe material	Titanium, (glass optional)
Thread of probe holder	G3 DIN ISO 228 external thread
Dimensions control cabinet (HxWxD)	2100 × 800 × 650 mm
Dimensions cartridge case (HxWxD)	650 × 450 × 250 mm
Dim. waterproof protection box (HxWxD)	1150 × 650 × 500 mm
Total weight control cabinet	approx. 250 kg

www.tuv.com TÜV Berlin ID:0011005400

Subject to change
without notice

Accessories

- XAD-II cartridges
- Transportation box of XAD-II cartridges
- License for software to read the memory card of AMESAWIN, incl. driver for SRAM-card
- Memory card, SRAM 1 MB
- up to 3 outputs 4–20 mA for P_{stat}-stack, $V_{fluegas}$, $T_{fluegas}$
- AMLEIT remote control

For outdoor installation

- Weather proof casing incl. heating

For outdoor temperatures < 0°C

- Extraction hose incl. electrical heating

If no cooling water is available

- Radiator unit

Additional analysis (in combination with PCDF/D analysis)

- PBDF/D, PBCDF/D
- PCB-/PCBz-analysis (Sum of Tri- up to DecaCB, 6 DIN- + 12 WHO-Kongenere; Penta- and HexaCBz)
- PCPh-analysis (10 tri- up to pentachloride congeneres)
- PAH-analysis (21 PAH-components)

Weather-proof housing for sampling probe and cartridge case

Special probe for high dust concentrations (up to 100 mg/m³)

Complies in principle US EPA method 23 A.

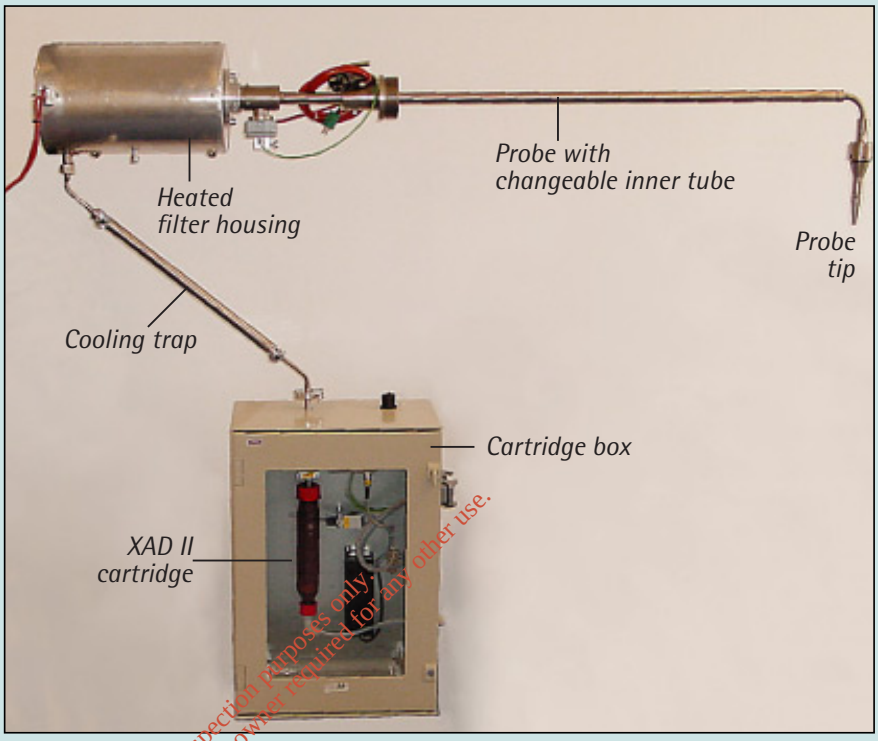
The standard-type approved AMESA® system is suitable for dust concentrations up to 20 mg/m³. For plants having higher dust loads, or for raw gas measurements, a special probe with an integrated heated filter is available.

The features are as follows:

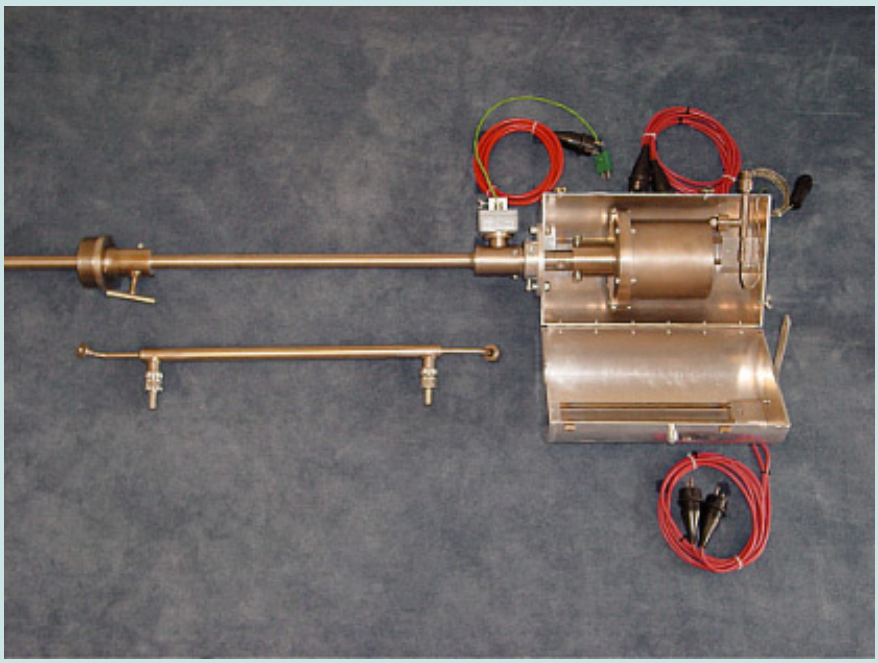
- all parts in contact with media are made entirely of either titanium or glass
- integrated heated dust filter (+120 °C up to max. +160 °C) with replaceable filter module to ensure longer sampling times for higher dust loads
- condenser trap between filter and XAD II cartridge
- replaceable inner glass or titanium tube

When using this probe, four parts, i.e. inner tube (titanium or glass), dust filter, XAD II cartridge and SRAM card, must be replaced and sent to the laboratory.

When using this option, AMESA® complies in principle with US EPA method 23 A.



Complete Hight-Dust probe including filter, cooling trap and cartridge box



Opened filter housing incl. heating

Sampling probe with cartridge case mounted in Weather-proof housing

AMLEIT remote monitoring

The AMLEIT system is designed for remote monitoring of AMESA® sampling systems.

Features

- Worldwide use by way of data exchange per modem via telephone network
- Simultaneous monitoring of 1 to 4 AMESA® per location
- Detailed display of
  Operating conditions
  Alarms
  Configuration and diagnosis data
- Service support by way of status display
- Monitoring by control room (option)

Hardware

Location

- Direct-dial telephone connection (provided by customer)
- AMLEIT coupling unit for connecting 1 to 4 control cabinets
- Connecting line between the individual AMESAs and the coupling unit

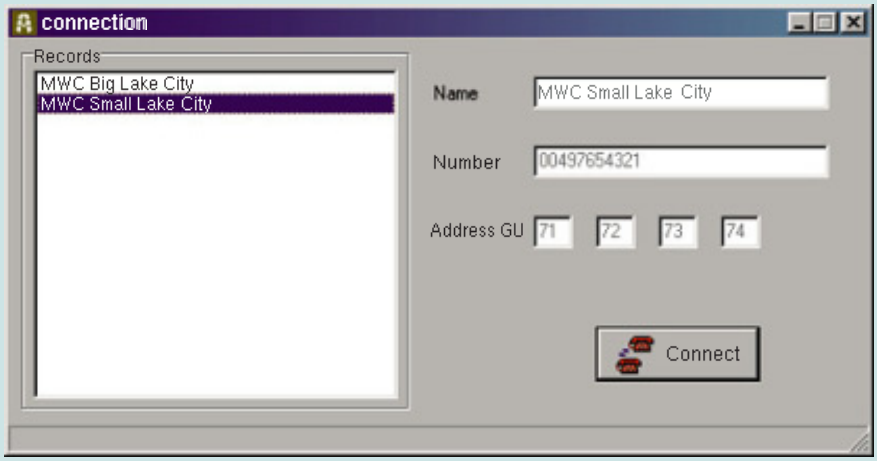
Monitoring

- Telephone connection with line authorization
- Modem or AVM Fritz card
- PC (see Technical Data)
- AMLEIT requires Win95/98/2000
- Coupling unit for control room monitoring (option)

Functions

Dial location

The **connection** menu enables a location to be selected from the telephone book. The connection to the selected location is established with the Connect button.



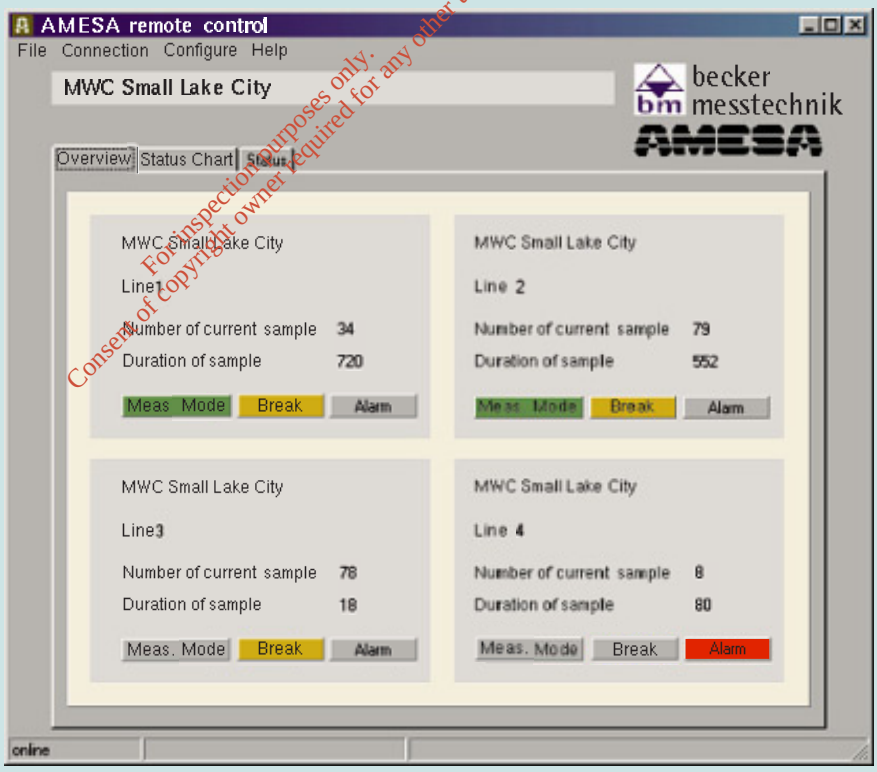
Dial location

The Overview appears as soon as the connection is established.

It shows the data of all the location's lines which are necessary for a quick assessment of the situation:

- Operator name and line
- Number of current or last sample
- Duration of sample
- Operating status: Measuring mode, break or alarm

One of the lines can be selected for closer inspection by clicking on it with the mouse.



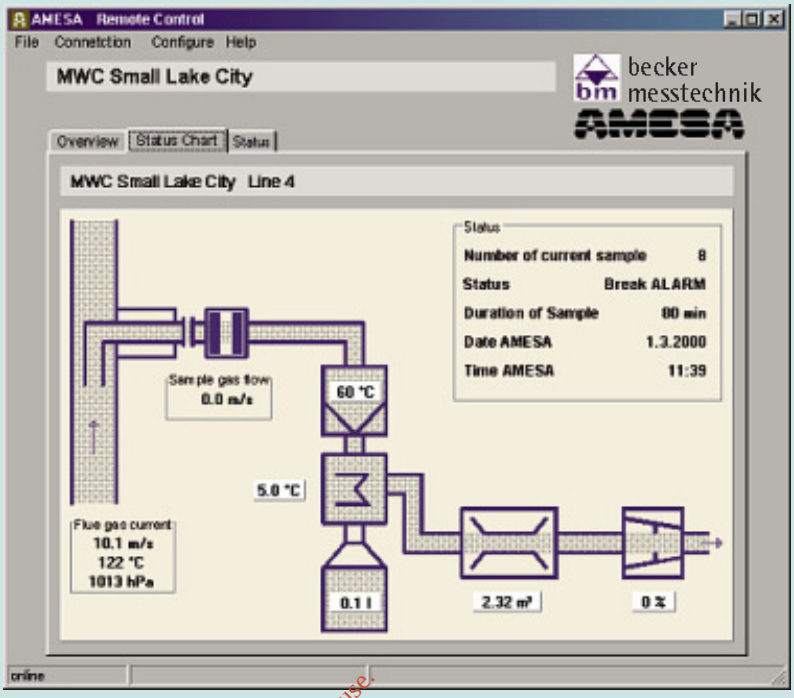
Overview

Two further windows are normally available for the line selected:

1. The status chart

The status chart shows a diagram of the plant with the main parts of the AMESA® system and the current operating data, such as:

- Static pressure in flue in hPa
- Flue gas velocity in m/s
- Flue gas temperature in °C
- Sample gas flow velocity in m/s
- Cartridge temperature in °C
- Temperature in gas cooler in °C
- Cumulative condensate volume in liters
- Cumulative gas throughput in Nm³
- Pump speed in %

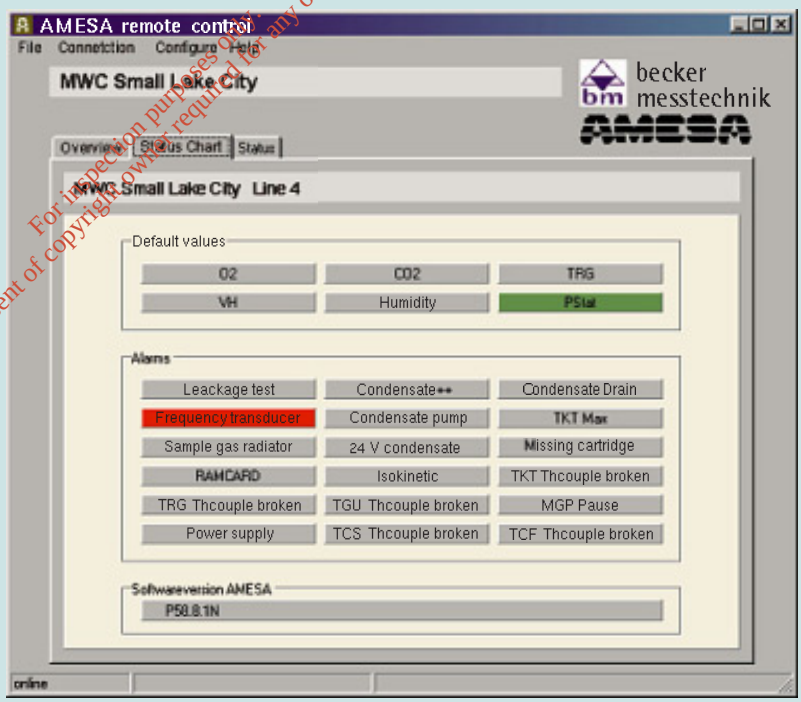


Status chart

2. Status

Status shows an overview of all default values and all alarms. Active elements are highlighted in colour. The latest software version of the AMESA® is an important source of information for service technicians.

A third Service window can be enabled and permits the display of the complete configuration of the selected AMESA® system, including all test menus for service purposes.



Status

Technical Data

Coupling unit

- Connection to the AMESA® units via a RS422 bus.
- External connection via an analog telephone connection

Monitoring

Minimum requirements:

- Pentium PC with 32 MByte RAM
- Monitor with min. resolution of 800x600
- A free COM interface
- Windows 95, 98 or 2000

Modem:

- ELSA MicroLink 28.8 TQV or 33.6 TQV for analog telephone line *(other modems may work, but this cannot be guarantee)*

or

- AVM Fritz card with analog modem emulation for ISDN connection

Results of continuous dioxin/furan emission control using AMESA®

Since 1999, a complete network of approx. 35 AMESA® units have been installed throughout Belgium. In the Walloon region of Belgium, twelve units were installed in four domestic waste incineration plants *(June 2002)*. The results of the long-term monitoring in this region have been published on the following Internet homepage:
http://environnement.wallonie.be/data/air/dioxines/menu/menu.htm

As the results show, some plants fulfil the low emission requirements to a very high degree while continuously monitoring results. However, the dioxin emissions of some plants may occasionally exceed the target values.

The example in fig. 1 shows the dioxin emissions of one plant over the entire year 2001. Each period covers two weeks. After 30 weeks of acceptable emission levels, this plant recorded a dioxin emission peak of 3.9 ng/m³ TEQ during period 16, and after that the plant continued to operate for several weeks at levels exceeding the target values. The specific reasons for the high dioxin emission values are detailed as follows:

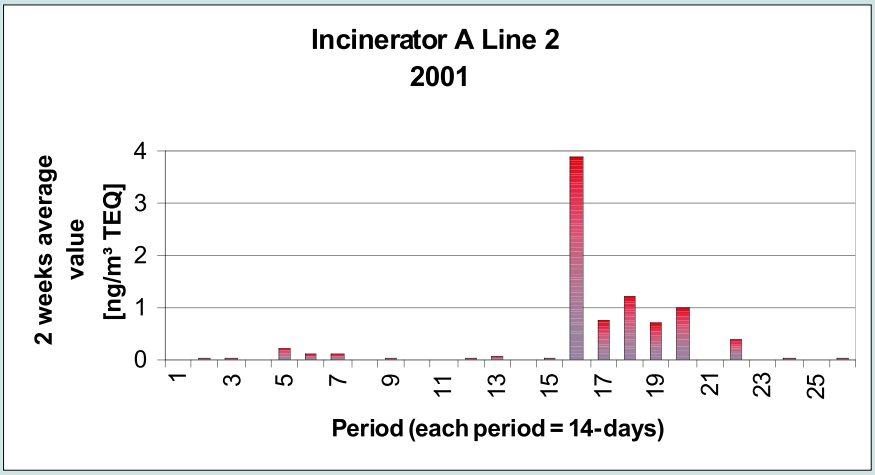


Fig. 1

Period 16: 1.8.–14.8.2001
The operator´s explanations (a clogged bag filter) are accepted.
Report to the Public Prosecutor

Period 17: 14.8.–29.8.2001
does not conform. Following this incidence of exceeding the permitted value, the operator was questioned and voluntarily stopped the furnace on 13 September 2001. The contractor responsible for the building work was summoned.

For the record, the breach during period 16 occurred because of a clogged bag filter. The unclogging carried out should have resolved the problem. A detailed investigation into the causes of the breach revealed a defect in the bag filter´s internal by-pass joints, an unforeseeable accident. These joints were therefore replaced and a general inspection of the bag filters was carried out to ensure that they were in good condition.

Once the reasons for the breach had been identified and steps taken to remedy the defects, authorisation was granted on 19 September 2001 to start up the furnace again. The ISSeP (Institut scientifique de service public – Public Utility Scientific Institute) will take a spot check sample to confirm that the measures taken have been effective. The test will be performed on cartridge 19, because cartridge 18 was sampled before the breach and the defect were discovered, and therefore before the problem was resolved.

Period 18: 29.8.–12.9.2001
does not conform.
The still existing problems were not yet assessed, therefore the furnace was still running before it was stopped on 13 Sept. 2001

Period 19: 12.9.–26.9.2001
does not conform.
A reading of 0.71 was obtained for furnace No. 2, which had already experienced an operational problem during periods 16 and 17. It was taken out of service. It appears that the problems with the operation of the bag filter, which caused the previous resolved. However, but steps are currently being taken to remedy this. Furnace No. 2 will not be started up again until the repairs are completed.

Period 20: 26.9.–10.10.2001
does not conform
A reading of 1.0 was obtained
Cartridge 20 was sampled before the results of period 19 were noted

Period 21: Furnace out of service

Period 22: 24.10.–6.11.2001
The furnace was in operation for 24 hours
Stops : stop (repair of the bag filters) => + 294 hours

Period 23 – 26: acceptable values below 0.1 ng/m³.

This example shows once again how important continuous monitoring by long-term sampling is. In the case of short-term collection for eight hours over 1 – 3 days per year, the possibility that these high dioxin emissions will be monitored is very small.

However, after the modifications, the same incinerator was running over an entire year with acceptable dioxin emission values (Fig. 2). Now the results can assist in getting more acceptance and trust by the general public in the area of the plant.

In general, in the Walloon region of Belgium, the total dioxin emission, which was reduced from the year 1995 to year 2001 by a factor of 100 to 0,64 g TEQ, could be reduced again by a factor 10 to 0,06 g TEQ in year 2002.
This shows how successful AMESA® can help to reduce the PCDD/PCDF emissions in an effective way.

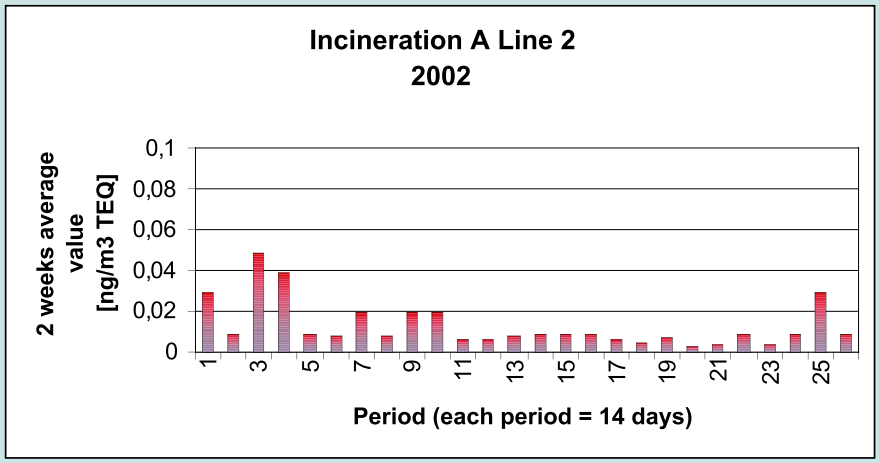


Fig. 2

References (2003)

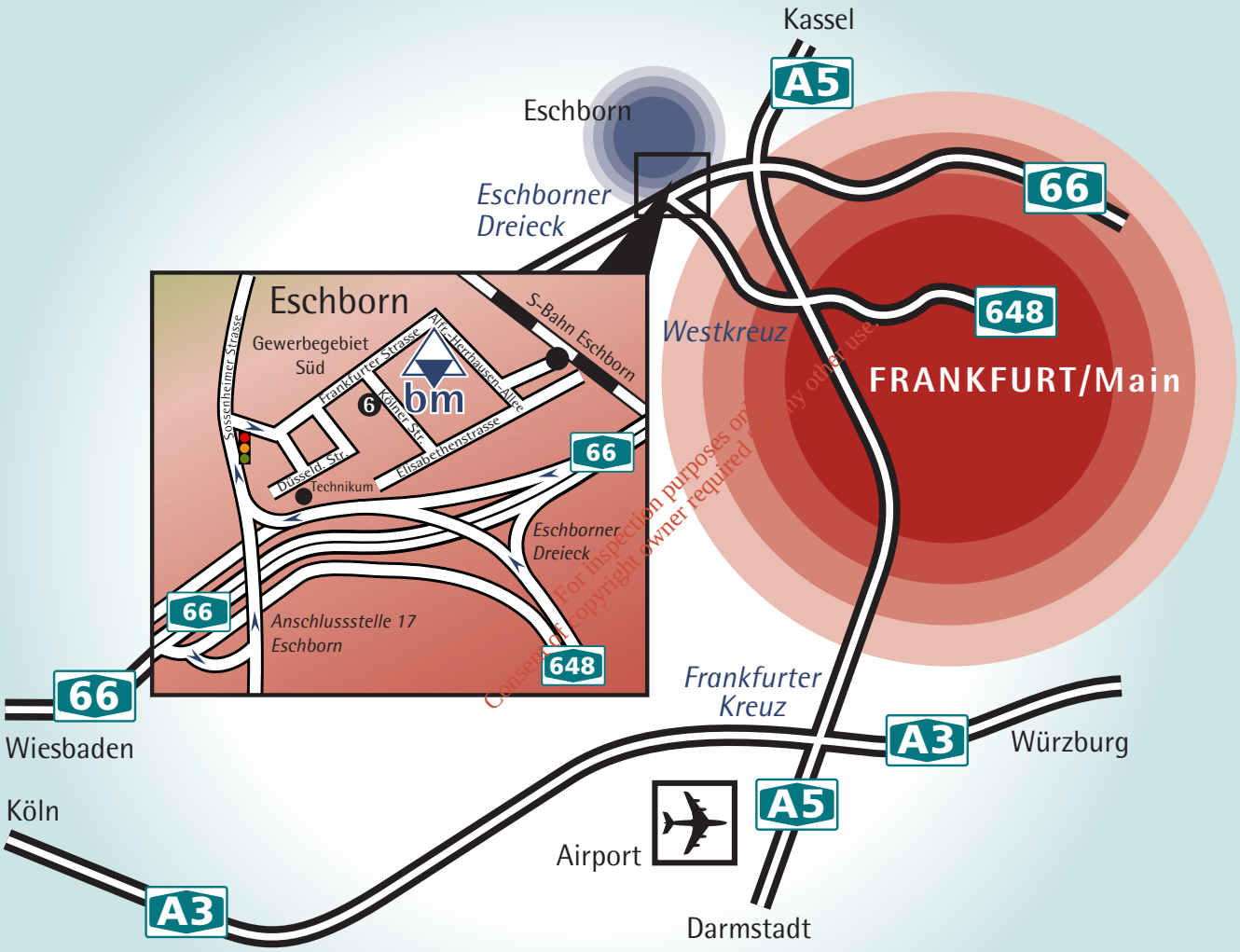
AMESA® was installed on more than 60 incineration burners, with the following units still being active:

8 waste incineration plants in the Flemish region of Belgium (16 units)
1 hazardous waste incineration plant in the Flemish region of Belgium (2 units)
1 smelter in the Flemish region of Belgium (1 unit)
4 waste incineration plants in the Walloon region of Belgium (12 units)
1 incineration plant in Bruxelles (2 units)
4 waste incineration plants in France (9 units)
1 incineration plant in the UK (2 units)
2 waste incineration plants in Germany (2 units)
3 wood incineration plants in Germany (3 units)
1 hazardous-waste incineration plant in Sweden (1 unit)
1 hazardous waste incineration plant in Finland (1 unit)
1 waste incineration plant in Taiwan (1 unit)
2 waste incineration plants in Japan (4 units)

In addition, 10 AMESA® units were temporarily installed in various waste and hazardous-waste incineration plants throughout Belgium, France, Germany, Netherlands and the UK.

Please contact us, if you need more information!

bm becker messtechnik



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Appendix F8: Monitoring and Sampling for Ambient Air Emissions

TABLE Ff (AA1): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS (1 table per media)

Monitoring Point Reference No : AA1-1

Parameter	Monitoring frequency	Accessibility of Sampling point
Odour	Annual	AA1-1 is located at the site boundary and is easily accessible (See Drawing 15013\WL\013 in Appendix E1)

Monitoring Point Reference No : AA1-2

Parameter	Monitoring frequency	Accessibility of Sampling point
Odour	Annual	AA1-2 is located in a neighbouring field to be accessed by Indaver with the landholder's permission (See Drawing 15013\WL\013 in Appendix E1)

Appendix F9: Monitoring and Sampling for Emission SW1

TABLE F.2 (SW1) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per media)
Emission Point Reference No(s). : SW1

Parameter	Monitoring frequency	Accessibility of Sampling Points
TOC	Continuous	Samples will be taken from above ground chambers accessible at the inlet and outlet of the underground firewater/stormwater attenuation tank as shown in Drawing 15013\WL\013 in Appendix E1.
pH	Continuous	As above
Conductivity	Continuous	As above
Temperature	Continuous	As above
Flow	Continuous	As above

Appendix F10: Monitoring and Sampling for Emission GW1

TABLE F.2 (GW1) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per media)
Emission Point Reference No(s). : GW1

Parameter	Monitoring frequency	Accessibility of Sampling Points
BOD	Quarterly	Samples will be taken from the sampling chamber, accessible from the raised bank surrounding the Puraflo modules as shown in Drawing 15013\WL\013 in Appendix E1.
COD	Quarterly	As above
TSS	Quarterly	As above

Appendix F11: Monitoring and Sampling for Ambient Groundwater Emissions

TABLE Ff (AGW1): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS (1 table per media)
Monitoring Point Reference No :_____AGW1-1, AGW1-2, AGW1-3_____

Parameter	Monitoring frequency	Accessibility of Sampling point
TOC Ammonia Conductivity	Monthly	Monitoring wells will be located onsite and are easily accessible for sampling. Their approximate location is indicated by AGW1-1 to AGW1-3 as shown in Drawing 15013\WL\013 in Appendix E1.
PH, nitrate, nitrite, chloride, metals (Cd, Tl, Hg, Pb, Cr, Cu, Mn, Ni, As, Co, V, Sn) and their compounds, organohalogens (priority pollutant list substances)	Biannually	As above

Appendix F12: Monitoring and Sampling for Ambient Noise Emissions

TABLE Ff (AN1): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS (1 table per media)
Monitoring Point Reference No :AN1-1, AN1-2, AN1-4

Parameter	Monitoring frequency	Accessibility of Sampling point
L_{aeq} L_{10} L_{A90} Frequency analysis (1/3 octave band analysis)	Annual	Monitoring points are located on or within the site boundary and are easily accessible (See Drawing 15013\WL\013 in Appendix E1)

Monitoring Point Reference No :AN1-3

Parameter	Monitoring frequency	Accessibility of Sampling point
L_{aeq} L_{10} L_{A90} Frequency analysis (1/3 octave band analysis)	Annual	Monitoring point is located in a neighbouring field to be accessed by Indaver with the landholder's permission (See Drawing 15013\WL\013 in Appendix E1)

Appendix F13: Monitoring and Sampling for Meteorological Conditions

TABLE Ff (AA2): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS (1 table per media)
Monitoring Point Reference No :AA2

Parameter	Monitoring frequency	Accessibility of Sampling point
Wind Speed, atmospheric pressure	Continuous	The station will be located near the site entrance and will be easily accessible (See Drawing 15013\WL\013 in Appendix E1)
Precipitation, Temperature	Daily	As above