Product Overview

Emission Monitoring
Ambient Monitoring
Environmental and Process Data
Management Systems
Introduction

The DURAG GROUP develops and manufactures products in the field of environmental measuring technology for measuring and monitoring:

- dust concentration and opacity
- total mercury concentration
- flue gas volume flow

as well as evaluation systems for the calculation of emissions.

The products are used worldwide in power generation plants and the process industry, such as e.g. fossil fuel power stations, waste incineration plants, refineries, chemical processing plants, cement works, the lime industry, the steel industry, filter and dust extraction plants as well as for monitoring ambient air.

The DURAG Group is known for its high standards of quality. DURAG has been ISO 9001 certified for a number of years and has fully implemented the corresponding requirements. The products are manufactured to national, European and international standards.

The following are taken into account:

- VDI 2066 / VDI 3950 – German dust measurement standard
- EN 14181 – European quality assurance standard for automatic measuring equipment
- EN 13284 – European standard for determining small dust concentrations
- EN 14884 – European standard for determining total mercury concentration
- EN 12341 – European standard for determining PM10 airborne dust
- ISO 10473 – International standard for beta absorption method
- ASTM D-6216.98 – American dust measurement standard.

DIN EN 14181

DIN EN 14181 defines three so-called quality assurance levels (QAL) and a new functional test (AST) for automatic measuring systems:

- QAL 1 – Testing the suitability of the equipment technology
- QAL 2 – Installation and calibration check
- QAL 3 – Continuous monitoring
- AST – Annual inspection

QAL 1 – Testing the suitability of the equipment technology

QAL 1 specifies the suitability of a measuring device by calculating the total measuring uncertainty according to EN ISO 14956 before installation, by taking account of all potential influences.

Devices that have passed the TUV suitability test and have been established as suitable measuring devices generally fulfill the standards of QAL 1.

QAL 2 – Installation and calibration check

Selection of the measuring location and correct installation of the measuring device. Calibration of the device using a standard reference method, min.15 measuring points distributed over 3 days, determination of the calibration curve or curves in different operating conditions (fuels, load, etc.) and definition of the area of validity of the calibration curve.

Calculation of the total measuring uncertainty of the measuring device.

QAL 3 – Continuous monitoring

Regular checks of the zero and reference point drift during the plant operation by the operating personnel should ensure reliable and correct operation of the measuring device.

AST – Annual inspection

The calibration curve found in QAL 2 must be checked / confirmed annually by means of 5 parallel measurements.

Monitor selection

In addition to the general data, such as desired measuring or measuring range, special account must be taken of the plant conditions at the measuring location when selecting a suitable measuring device, especially in the case of dust concentration measurement.

Opacity

A light beam sent through a mixture of gas and particles is attenuated by absorption and diffusion. The more particles are found in the light beam, the stronger the opacity. The ratio of received light to initial light is a measurement of the transmission or the reciprocal opacity.

Extinction

By converting the transmission to extinction and after a gravimetric comparison measurement the display is in mg/m². For dust concentrations this result is displayed in mg/Nm³ by calculation with the reference units T, P, RF.

Scattered light

A light source emits light which is diffused by particles in the gas and recorded by a detector. The scattered light principle is suitable for small dust loads to under 1 mg/m³. The relationship between measured value display and dust load is determined by means of gravimetric comparison measurement.

Smoke spot number (soot)

Scattered light measurement with very low measuring range. Smoke spot number 1 corresponds to approx. 100 µg/m³. A comparison measurement determines the relationship between display and smoke spot number.

Triboelectricity

Triboelectricity results from friction between bodies or particles. If these charged particles strike a measuring probe, an electron transfer takes place. The value of the charge is a measurement for the dust mass flow rate. The relationship between measured value display and dust concentration can be determined by a gravimetric comparison measurement.

Dew point

Every gas mixture contains a defined quantity of humidity. The maximum possible saturation humidity is dependent on the temperature: if air is continuously cooled, with constant absolute air humidity the relative air humidity increases up to 100%. If the air is further cooled, the humidity condenses as water drops and affects the measuring result in optical and triboelectric measuring procedures.

Temperature

The ambient temperature of the measuring head may be maximum 50°C. In optical systems, the purge air is also used as cooling air and separates the hot exhaust gas through the purge air buffer. In transmission systems, the standard assembly connection can be used up to an exhaust gas temperature of 200°C. Beyond this, the connection must be extended (approx. 1 mm / °C).

Pressure

The standard purge air blower can be used up to a channel overpressure of 20 hPa. Beyond this, special blowers are available. A flap valve should be used in the event of overpressures.
## Devices for measuring emissions and immissions

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<thead>
<tr>
<th>Measurement</th>
<th>Opacity</th>
<th>Dust / Opacity</th>
<th>Dust</th>
<th>Soot</th>
<th>Dust</th>
<th>Dust</th>
<th>Total</th>
<th>Mercury</th>
<th>Ambient</th>
<th>Dust</th>
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<td>UV Photometer</td>
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<td>D-R 290</td>
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<td>F-904-20</td>
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<td>Calibratable in</td>
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<td>Measuring ranges</td>
<td>0-25...100%</td>
<td>0-0.2...1.6 Ext</td>
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<td>0-20...100%</td>
<td>0-1...100</td>
<td>0-10...200 mg/m³</td>
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<td>20 mg/m³</td>
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* with measuring range switching 1000 mg/m³
** test pending

## Comparison of emission dust monitors according to application criteria

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<th>Duct diameter</th>
<th>0,3 m</th>
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<th>Exhaust gas temperature</th>
<th>dew point</th>
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<thead>
<tr>
<th>Relative humidity</th>
<th>100%</th>
<th>80%</th>
<th>0%</th>
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<tbody>
<tr>
<td>tribo</td>
<td>optical</td>
<td>beta</td>
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</table>
Optical opacity meter

The reliable system for monitoring dust emissions on small plants.

Features
- In-situ measurement directly in the flue gas flow
- Digital operation with microprocessor
- Adjustable limit value
- Contact switch outputs for pre-alarm and auto-power off
- Switchable measuring value integral 8 / 64 seconds.

Applications
- Compact device for smaller plants
- Heating stations, power stations
- Boiler plants in industry, barracks, hospitals, schools
- Dust extraction and filter plants
- Control of processes in the chemical industry.

Approvals
- Suitability-tested by the TÜV Cologne, test report 936/804004
- Itemized in the list of suitable measuring devices for continuous emission measuring.

Measuring principle

The device operates using the double-pass method according to the auto-collimation principle. The light beam traverses the measuring distance twice. The attenuation of the light beam by the dust content in the measuring section is measured and evaluated.

System components
- D-R 216-40 measuring head
- Reflectors for measuring distances 0.4 to 6.25 m
- Mounting flanges
- Connection terminal box
- Zero point reflector
- Purge air unit.

Models

<table>
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<th>Display</th>
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<td>opacity</td>
</tr>
<tr>
<td>D-R 216-41</td>
<td>with</td>
<td>0–100%</td>
<td>opacity</td>
</tr>
<tr>
<td>D-R 216-45</td>
<td>without</td>
<td>0–50%</td>
<td>opacity</td>
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<tr>
<td>D-R 216-46</td>
<td>with</td>
<td>0–50%</td>
<td>opacity</td>
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<tr>
<td>D-R 216-47</td>
<td>without</td>
<td>0–25%*</td>
<td>opacity</td>
</tr>
<tr>
<td>D-R 216-48</td>
<td>with</td>
<td>0–25%*</td>
<td>opacity</td>
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<tr>
<td>D-R 216 OD</td>
<td>without</td>
<td>0–0.2*</td>
<td>extinction</td>
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<td></td>
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<td>0–0.4</td>
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<td>0–0.8</td>
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<td>0–1.6</td>
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</table>

*measuring path max. 3 m

Options
- D-R 216-41 measuring head with integrated auto-power off for boiler plants that are operated without supervision as per TRD 604 (BoB)
- Measuring head with spread measuring ranges 0–30% and 0–25% opacity
- D-R 216 OD with measuring results in extinction (calibratable for concentration display in mg/m³ dust)
- Weather protection covers for measuring head, reflector and purge air unit
- Quick-closing shutters to protect measuring device in the event of failure of the purge air supply.
Optical opacity /dust monitor

Standard system for plants with concentrations >50 mg/m³.

Features
- In-situ measuring procedure, continuous measurement
- Semi-conductor source with long service life
- Super-wide band diode (SWBD), which provides more stable measuring results in comparison to devices with conventional LEDs
- Powerful microprocessor technology
- Measured value display on LC display in opacity, extinction or in mg/m³
- Automatic function tests with correction of measured values in relation to soiling
- Optics and electronics in a hermetically sealed unit - no smoke gas can enter device
- Easy adjustment without additional equipment
- Low-maintenance thanks to optimal purge air conduction.

Applications
Plants in which the dust concentration quantity needs to be measured, e.g.:
- Furnace plants with semi-anthracite coal, brown coal, fuel oil and combined heating
- Converter plants, asphalt mixing plants
- Plants for cement manufacture.

Approvals
- Suitability-tested by the TÜV Cologne, test report 936/801017
- Itemized in the list of suitable measuring devices for continuous emission measuring.
- MCERTS

Measuring principle
The device operates using the double-pass method according to the auto-collimation principle. The light beam traverses the measuring distance twice. The attenuation of the light beam by the dust content in the measuring section is measured and evaluated.

System components
- Mounting flanges
- Measuring head
- Reflector
- Control and display unit
- Purge air unit.

Options
- Bus interface, e.g. Modbus or similar
- Automatic quick-closing shutters to protect the measuring head and the reflector in the event of failure of the purge air
- Weather protection covers, for outdoor installation
- Explosion proof design for EEx p, Zone 1 or Zone 2
- With an additional display unit at the measuring location, the control and display unit can be installed in up to 1000 m distance away
- Temperature compensation through additional analog input
- Special model for measuring distances up to 18 m with 2 purge air units
- Filter set for sensitivity and linearity control.

<table>
<thead>
<tr>
<th>measurements</th>
<th>opacity, extinction</th>
<th>detection limit</th>
<th>&lt;2% of measuring range</th>
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<tbody>
<tr>
<td>switchable measuring ranges</td>
<td>opacity: extinction: 0–20% ... 0–100% dust: 0–100 mg/m³ ... 0–4000 mg/m³</td>
<td>reference point drift</td>
<td>&lt;0.4% of measuring range/month</td>
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<tr>
<td>measuring principle</td>
<td>transmission</td>
<td>zero point drift</td>
<td>&lt;0.4% of measuring range/month</td>
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<td>flue gas temperature</td>
<td>above dew point up to 250°C, optional up to 1000°C, depending on application</td>
<td>supply voltage</td>
<td>95–264 VAC, 47–63 Hz, 30 VA</td>
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<tr>
<td>flue gas pressure</td>
<td>-50 up to +20 hPa, optional higher</td>
<td>dimensions (h x w x d)</td>
<td>measuring head 363 x 185 x 398 mm</td>
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<tr>
<td>duct diameter</td>
<td>1 up to 12 m, optional up to 18 m</td>
<td>weight</td>
<td>7 kg</td>
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<tr>
<td>ambient temperature</td>
<td>-20 up to +50°C, optional higher</td>
<td>remarks</td>
<td>✔ with reference to one meter of path length after gravimetric calibration</td>
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<tr>
<td>protection</td>
<td>IP65, Ex optional</td>
<td>purge air supply</td>
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<tr>
<td>measuring outputs</td>
<td>2 x 0 / 4–20 mA / 500 Ohm, manual or automatic measuring range switching, optional Modbus RTU (RS 485)</td>
<td>purge air quantity</td>
<td>approx. 80 m³/h</td>
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<td>digital outputs</td>
<td>6 programmable relay outputs, permissible load 250 V / 100 VA</td>
<td>supply voltage</td>
<td>115/230 VAC, 50/60 Hz, 0.37 / 0.43 kW</td>
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<td>digital inputs</td>
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<td>accuracy</td>
<td>&lt;1% of measuring range</td>
<td>protection</td>
<td>IP54</td>
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Measuring device for smoke spot number

Extremely sensitive device for measuring smoke spot number.

Features
- In-situ measurement directly in the flue gas flow
- Automatic system tests and correction of measured values
- Self-calibration in 4-h cycle
- Optics and electronics in a hermetically sealed unit - no smoke gas can enter device
- Maintenance-friendly, thanks to optimal purge air conduction in front of the heated optical end plates
- Direct access to all parameters via the operator display.

Applications
- Smoke spot number measurement in furnaces designed for light fuel oil.

Approvals
- Suitability-tested by the TÜV Cologne, test report 936/800002
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS pending.

Specifications
- Measuring range: smoke spot number 0-3.
- Limit value II can be set as delayed disconnected contact

System components
- Measuring head
- Mounting flange
- Control and display unit
- 2 light traps
- Purge air unit.

Options
- Weather protection covers
- Quick-closing shutter to protect measuring device in the event of failure of the purge air supply
- Halar flange coating.

Measuring principle
The D-R 300 meter operates according to the scattered light method. The modulated light from a Halogen lamp illuminates the dust particles in the exhaust duct. The scattered light reflected from these particles is measured and assessed.

Applications
- Smoke spot number measurement in furnaces designed for light fuel oil.

Approvals
- Suitability-tested by the TÜV Cologne, test report 936/800002
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS pending.
Measuring device for dust concentration

Especially sensitive measuring device for the smallest concentration of dust, in particular in waste incineration plants.

Features
- In-situ measurement directly in the flue gas flow
- Automatic system tests and correction of measured values
- Self-calibration in 4-h cycle
- Optics and electronics in a hermetically sealed unit - no smoke gas can enter device
- Maintenance-friendly, thanks to optimal purge air conduction in front of the heated optical end plates
- Direct access to all parameters via the operator display
- Automatic measuring range selection in accordance with 17. BImSchV

Applications
- Fine dust measurements in processes
- Waste incineration
- Filter monitoring and emission-value measuring in waste incineration and power plants.

Approvals
- Suitability-tested by the TÜV Cologne, test report 936/801004
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS pending.

Measuring principle
The D-R 300-40 meter operates according to the scattered light method. The modulated light from a Halogen lamp illuminates the dust particles in the exhaust duct. The scattered light reflected from these particles is measured and assessed.

Specifications
- Minimum measuring range 0-1 mg/m³ dust concentration. Other measuring ranges up to 300 mg/m³ can be set (optional automatic switching of measuring ranges 1:3:9)

System components
- Measuring head
- Mounting flange
- Control and display unit
- 1 light trap
- Purge air unit.

Options
- Automatic measuring range selection for dust measurement in accordance with 17. BImSchV
- Weather protection covers
- Quick-closing shutter to protect measuring device in the event of failure of the purge air supply
- High temperature option up to 500°C with additional redundant purge air units
- Halar flange coating for waste incineration plants.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Dust concentration</th>
<th>Detection limit</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1 mg/m³</td>
<td>&lt;1% of measuring range</td>
<td>&lt;0.2% of measuring range/month</td>
<td></td>
</tr>
<tr>
<td>0–10 mg/m³</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>0–30 mg/m³</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>0–300 mg/m³</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring principle</th>
<th>Reference point drift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back scattering</td>
<td>&lt;0.2% of measuring range/month</td>
</tr>
<tr>
<td>Zero point drift</td>
<td>&lt;0.2% of measuring range/month</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flue gas temperature</th>
<th>Supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above dew point up to 320°C</td>
<td>115 / 230 VAC, 50 / 60 Hz, 50 VA</td>
</tr>
<tr>
<td>Optional up to 600°C</td>
<td>n/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flue gas pressure</th>
<th>Dimensions (h x w x d)</th>
<th>Measuring head</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50 up to +200 hPa</td>
<td>565 x 310 x 200 mm</td>
<td>n/a</td>
<td>18 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duct diameter</th>
<th>Ambient temperature</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 bis 4 m</td>
<td>-20 up to +50°C</td>
<td>n/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection</th>
<th>Purge air supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP65</td>
<td>n/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring outputs</th>
<th>Purge air quantity</th>
<th>Measuring range switching</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 0/4–20 mA/500 Ohm</td>
<td>approx. 80 m³/h</td>
<td>n/a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital outputs</th>
<th>Supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 relay outputs, permissible load 250 V / 100 VA</td>
<td>115 / 230 VAC, 50 / 60 Hz, 0.37 / 0.43 kW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>Dimensions (h x w x d)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 potential free input</td>
<td>350 x 550 x 500 mm</td>
<td>12 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1% of measuring range</td>
<td>IP54</td>
</tr>
</tbody>
</table>
Dust monitor

Innovative measuring device with laser technology to monitor small to medium dust emission according to the new European regulations.

Features

- Integrated display: Measuring value, threshold value, parameter in probe
- In-situ measuring procedure with continuous measurement
- High sensitivity
- Easy installation on one side of the duct
- Can also be deployed in thick-walled stone/insulated channels
- Long lifetime, as there are no moving parts inside the duct
- Hermetically sealed electronic housing against exhaust gas
- Parameterisation and operation with keyboard plus easily readable display directly on device or via bus interface
- Automatic function test with soiling correction
- Two analog outputs with adjustable measuring ranges
- Automatic switching of measuring ranges according to 17. BImSchV.

Applications

- Power stations
- Cement plants, the metallurgy and wood industries, chemical industry etc.
- Waste incineration plants
- Monitoring of dust filter plants.

Approvals

- Suitability test and MCERTS via Technical Inspection Agency (TÜV) pending.

Applications

- Power stations
- Cement plants, the metallurgy and wood industries, chemical industry etc.
- Waste incineration plants
- Monitoring of dust filter plants.

Approvals

- Suitability test and MCERTS via Technical Inspection Agency (TÜV) pending.

Measuring principle

The D-R 800 device works according to the principle of forward scattering. The concentrated and modulated light of a laser diode penetrates the measuring volume. The forward-scattered light largely reflected from dust particles is measured and assessed.

System components

- Measuring lance
- Supply unit with integrated purge air supply
- Mounting flange 130 / 240 / 500 mm.

Options

- Weather protection cover
- Temperature compensation through additional analog input.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Accuracy</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust concentration</td>
<td>&lt;2% of measuring range</td>
<td></td>
</tr>
<tr>
<td>Measuring ranges</td>
<td></td>
<td>1) after gravimetric calibration</td>
</tr>
<tr>
<td>Flue gas temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flue gas pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duct diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital inputs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) after gravimetric calibration
Combined probe sensor

Single rod measurement probe for simultaneous measurement of
- Dust concentration [mg/Nm³]
- Volume flow [Nm³/h]
- Temperature [°C]
- Absolute pressure [hPa].

Features
- Only one probe / installation opening in the exhaust gas channel
- Compact design, no moving parts, no consumable parts
- Continuous conversion to normalised dust concentration in mg/Nm³ and to normalised volume flow in Nm³/h
- LCD display in mg/Nm³, Nm³/h, °C and hPa, one analog output for each measurement value
- Parameterization at the control unit without the need of a PC or other tools
- Remote connection of control and evaluation unit via two-wire bus interface up to 1000 m.

Applications
- For measurements in accordance with TI Air (Technical Instructions for Maintaining Air Purity), 13., 17. and 27. BImSchV
- Not suitable for use behind electrostatic precipitators. Please consult us.

Approvals
- Suitability-tested by the TÜV Cologne, test report 936/800006/A
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS pending.

Measuring principle
- The tribo probe measures the electric charge of the incident particles.
- The measurement of the volume flow is based on the mechanical action principle. The probe has two separate chambers, between which a differential pressure builds up under flow.
- The absolute pressure in the flue gas is measured by a pressure transmitter in one chamber of the probe.
- The temperature is measured directly in the centre of the flue gas flow in a separate chamber within the probe with a temperature sensor.
- Dust concentration is calculated from the triboelectric measuring signal and the volume flow. To this purpose in calibration, you receive the necessary parameters for the relevant speed ranges, which form the basis for calculating dust concentration. The raw data that are also measured for gas temperature and absolute pressure are used to calculate the standard dust concentration and the standard volume flow (wet).

System components

Options
- Weather protection cover
- Switch-over cock for back purging / zero point control
- Automatic cyclic probe back purging for high dust concentrations
- Hastelloy probes for corrosive gases
- Purge air connection at flange.

<table>
<thead>
<tr>
<th>measurements</th>
<th>dust concentration, volume flow, absolute pressure, temperature</th>
<th>detection limit</th>
<th>&lt;2% of measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>measuring ranges</td>
<td>0–10 ..., 0–500 mg/Nm³</td>
<td>reference point drift</td>
<td>&lt;1% of measuring range/month</td>
</tr>
<tr>
<td>measuring principle</td>
<td>0–9,999,999 Nm³/h</td>
<td>zero point drift</td>
<td>&lt;1% of measuring range/month</td>
</tr>
<tr>
<td>flue gas temperature</td>
<td>0–200°C, optional 0–350°C</td>
<td>supply voltage</td>
<td>115 / 230 VAC, 50 / 60 Hz, 50 VA</td>
</tr>
<tr>
<td>flue gas pressure</td>
<td>0–1,300 hPa</td>
<td>dimensions</td>
<td>200 x 180 x (340 + probe length) mm</td>
</tr>
<tr>
<td>duct diameter</td>
<td>0.3–4 m</td>
<td>probe length</td>
<td>180, 200, 220, 240 mm</td>
</tr>
<tr>
<td>ambient temperature</td>
<td>-20 up to +50°C</td>
<td>probe back purging (option)</td>
<td>purge air supply 3 bar</td>
</tr>
<tr>
<td>protection</td>
<td>IP65</td>
<td>insulator purging (option)</td>
<td>continuous purge air supply approx. 2 m³/h</td>
</tr>
<tr>
<td>measuring outputs</td>
<td>4x 0 / 4–20 mA / 500 Ohms, Modbus RTU (RS485)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>digital outputs</td>
<td>7 relay outputs, permissible load 250 V / 100 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>digital inputs</td>
<td>6 potential free inputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>accuracy</td>
<td>&lt;2% of measuring range</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Flue gas velocity >5 m/s concentration after gravimetric calibration
Filter monitor

Triboelectric filter monitor for efficiency monitoring after filter plants and for continuous dust measuring in dry emissions.

Features
● Compact and rugged design
● Good price/performance ratio
● Ideal for monitoring bag filters
● Minimal maintenance required
● Early detection of filter malfunctions
● Savings in cost, as no preventative filter exchange is necessary.

Applications
● Power stations
● Bag filter plants of all types
● Dust extraction plants in the production industry
● Waste incineration plants
● Crematoriums
● Not suitable for use directly behind electrostatic precipitators.

Approvals
● Suitability-tested by the TÜV Hamburg, test report 98CU026
● Itemized in the list of suitable measuring devices for continuous emission measuring.

Measuring principle
The filter monitor uses the triboelectric effect to determine dust loads in flowing gases. The electrical charge which the dust particles experience due to friction is picked up by a probe protruding into the dust channel and converted into a measuring signal by electronics. The measuring signal is proportional to the dust concentration and is calibratable at a constant gas speed.

System versions
D-FW 231 measuring probe
● With complete electronics in the probe
● Probe rod length 400 mm
● Fitted via 1”(G1) thread

D-FW 230 filter monitor
● D-FW 231 measuring probe Probe rod length 400 mm
● D-FW 230-B control unit with digital display 115/230V 50/60 Hz.

Options
● Measuring gas temperature up to 500°C
● Ex version D-FW 240/Ex

D-FW 231 measuring probe
- With complete electronics in the probe
- Probe rod length 400 mm
- Fitted via 1”(G1) thread

D-FW 230 filter monitor
- D-FW 231 measuring probe Probe rod length 400 mm
- D-FW 230-B control unit with digital display 115/230V 50/60 Hz.

Meteorological control units
● Weather protection cover
● Various mounting options (flange, connection piece)
● Probe rod lengths 80, 250, 700 mm

Electrical ratings:
- Supply voltage: 24 VDC, 5 VA
- Supply voltage: 115/230 VAC, 50/60 Hz, 10 VA*

Technical data:
- Flue gas temperature: above dew point up to 200°C, optional up to 500°C, flue gas humidity <80%
- Flue gas pressure: -500 up to +500 hPa
- Airflow: 0.3–4 m
- Ambient temperature: -20 up to +50 °C
- Protection: IP65
- Measuring outputs: 0 / 4–20 mA / 500 Ohm
- Digital outputs*: 1 relay output, permissible load 250 V / 100 VA
- Digital inputs*: 2 potential free inputs
- Accuracy: <2% of measuring range

Remarks: *D-FW 230 only

D-FW 230 [80, 250, 700 mm]

D-FW 231 [400 mm]
Mobile filter monitor

Mobile measuring system with triboelectric probe and integrated data recording for efficiency monitoring after filter plants.

Features
- Compact and rugged design
- Ideal for bag filter plant monitoring
- Early detection of filter malfunction
- Portable design for random inspection of entire filter plants
- Saves costs since preventive filter change is unnecessary.

Applications
- Power stations
- Bag filter plants of all types
- Dust extraction plants in the production industry
- Waste incineration plants
- Crematoriums
- Sampling inspection in filter plants
- Acceptance reporting of filter plants
- Trouble shooting limit value exceedance in filter plants
- Not suitable for use in plants with electrostatic filters.

Approvals
- Suitability-tested by the TÜV Hamburg, test report 98CU026
- Itemized in the list of suitable measuring devices for continuous emission measuring.

Measuring principle
The filter monitor uses the triboelectric effect to determine dust loads in flowing gases.

System components
- Filter monitor D-FW 231
- Three measuring probes, lengths 80 mm, 250 mm and 400 mm
- Line recorder
- Accessories
- System container.

System versions
D-FW 235-21 measuring system
- with single-channel strip chart recorder, including an interface to a PC. The line recorder calculates and records min/max values and integrated measured values and prints them out on paper.

D-FW 235-34 measuring system
- with four-channel paperless recorder, colour screen and data storage options plus three additional current inputs for inclusion of other measured values.

Mobile filter monitor

Mobile measuring system with triboelectric probe and integrated data recording for efficiency monitoring after filter plants.

Features
- Compact and rugged design
- Ideal for bag filter plant monitoring
- Early detection of filter malfunction
- Portable design for random inspection of entire filter plants
- Saves costs since preventive filter change is unnecessary.

Applications
- Power stations
- Bag filter plants of all types
- Dust extraction plants in the production industry
- Waste incineration plants
- Crematoriums
- Sampling inspection in filter plants
- Acceptance reporting of filter plants
- Trouble shooting limit value exceedance in filter plants
- Not suitable for use in plants with electrostatic filters.

Approvals
- Suitability-tested by the TÜV Hamburg, test report 98CU026
- Itemized in the list of suitable measuring devices for continuous emission measuring.

Options
- Measuring gas temperature up to 500°C
- Other probe lengths
- Adaptor for 3”-flanges, DIN-flange and taper flange
- Longer connection cable between probe and system container.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Dust mass flow</th>
<th>Detection limit</th>
<th>Supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0–100% (flue gas velocity &gt;5 m/s)</td>
<td>&lt;2% of measuring range/month</td>
<td>115 / 230 VAC, 50 / 60 Hz, 10 VA</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Triboelectric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flue gas temperature</td>
<td>Above dew point up to 200°C, optional up to 500°C, flue gas humidity &lt;80%</td>
<td></td>
<td>180 x 80 x (270 + probe length) mm 90, 250, 400, 700 mm</td>
</tr>
<tr>
<td>Flue gas pressure</td>
<td>-500 up to +500 hPa</td>
<td></td>
<td>520 x 205 x 460 mm</td>
</tr>
<tr>
<td>Duct diameter</td>
<td>0.3–4 m</td>
<td>Weight</td>
<td>13.5 kg</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 up to +50°C</td>
<td>Weight system container</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>IP54 lid closed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring outputs</td>
<td>0 / 4–20 mA / 500 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>&lt;2% of measuring range</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Extractive beta gauge particulate monitor

Dust monitor especially for wet flues - emission temperature under dew point - and for the monitoring of blast furnace gas.

Features
- Automatic zero correction
- Pre-calibrated, unaffected by particle size, colour or moisture
- Sample gas flow regulated at 1 - 3 m³/h
- Isokinetic sampling
- Optional dilution sample probe for high concentrations or after wet scrubbers
- Heavy metal analysis possible
- Special model with measuring chamber purging and CO-TLV monitoring during dust monitoring of blast furnace gas.

Applications
- Coal and oil-fired power stations
- Waste incineration plants (municipal waste, industrial waste and hazardous waste)
- Sewage sludge incineration plants
- Emission dust measurement after wet scrubbers or in very wet exhaust gases
- Heavy metal analysis
- Measurement of very low dust concentrations in emissions
- Emission dust measurement in inaccessible flues with small diameter
- Dust concentration measurements in process applications.

Approvals
- Suitability-tested by the TÜV Essen, test report 3.5.2/209/88-338529
- Itemized in the list of suitable measuring devices for continuous emission measuring
- Type approval: HH 1/98
- PTB test certificate no. 6.22-R202.

Measuring principle
Determination of the dust concentration by measuring the absorption of beta rays emitted by a radioactive emitter by particles collected from an exhaust gas flow.

System components
- Heated sample probe (material 1.4571 or titanium), with or without dilution
- Heated sample line in 1.4571
- Filter tape in gas-tight filter holder
- C-14 emitter and detector (Geiger-Müller counter)
- Sample gas cooler
- PLC control, also for calculating the concentration from the dust content.

Options
- Special design F-904-20/BFG for measurement of the dust concentration in toxic and explosive blast-furnace gas with shut-off valves for the sample gas during filter transport and with purge gas (usually nitrogen) for line back purging. A CO detector is also provided, which closes all gauge connections to the process gas if the CO threshold limit value is exceeded and gives an alarm
- Filter tape printer and protective sheet for specimens in heavy metal analyses.

<table>
<thead>
<tr>
<th>measurements</th>
<th>measurement principle</th>
<th>reference point drift</th>
<th>accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>dust concen.</td>
<td>beta ray absorption</td>
<td>zero point drift</td>
<td>&lt;5% of measuring range</td>
</tr>
<tr>
<td>measuring</td>
<td></td>
<td>automatic zero point correction</td>
<td></td>
</tr>
<tr>
<td>ranges</td>
<td>0–1 ... 0–1000 mg/Nm³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>flue gas</td>
<td></td>
<td>supply voltage</td>
<td></td>
</tr>
<tr>
<td>temperature</td>
<td>0–250°C, optional up to 500°C</td>
<td>115 / 230 VAC 50 / 60 Hz, 5 kVA</td>
<td></td>
</tr>
<tr>
<td>flue gas</td>
<td>-100 up to +100 hPa</td>
<td>dimensions (h x w x d)</td>
<td></td>
</tr>
<tr>
<td>pressure</td>
<td></td>
<td>1600 x 800 x 800 mm</td>
<td></td>
</tr>
<tr>
<td>duct diameter</td>
<td>&gt;0.5 m</td>
<td>weight</td>
<td>300 kg</td>
</tr>
<tr>
<td>ambient</td>
<td>0 up to +50°C, cooler optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>temperature</td>
<td></td>
<td>purge air supply</td>
<td>pressurized air 6–8 bar</td>
</tr>
<tr>
<td>protection</td>
<td>IP43 (with filter blower), upgradable to IP54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>measuring</td>
<td>2 x 0 / 4–20 mA / 450 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>outputs</td>
<td>11 relay outputs, permissible load 24 V / 25 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>digital</td>
<td>2 potential free inputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inputs</td>
<td></td>
<td>accuracy</td>
<td>&lt;5% of measuring range</td>
</tr>
<tr>
<td>option</td>
<td>dust monitoring of blast furnace gas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Beta gauge particulate monitor

A measuring device for the continuous monitoring of the smallest concentration of particles in the ambient air (fine dust).

Features
- C-14 method, no measurable decrease in activity
- Lowest radioactivity of all beta gauges, usable without licence, or disclosure
- Automatic zero correction
- Pre-calibrated, no site-specific calibration required
- Mass-flow controlled sample flow 1 m³/h
- Extraction of a constant sample flow, irrespective of the ambient temperature
- Repeated collection on the same spot, collected particles available for heavy metal analysis
- RS-232 interface and analog output, status signals

Applications
- Immissions measuring systems for monitoring fine dust
- Mobile immissions-measuring
- Dust measurement in health and safety applications
- Interior dust measurements
- Measurement and collection of dust particles for heavy metal analysis
- Long-term background studies in ambient dust concentration
- Dust measurement and collection at problem sites and repositories
- Dust measurement for secondary emission of repositories (e.g. coal)
- Dust measurement in supply air and exhaust ducts.

Approvals
- Type-tested by TÜV.

Measuring principle
The measuring principle of the F-701-20 ambient dust monitor is based on the absorption of the beta rays (electrons) emitted by a radioactive emitter through particles collected from an ambient air flow. In the F-701-20 the pulse rate of the unloaded filter tape is measured before each collecting cycle, then dust is collected on this precise filter spot over a pre-defined period, and finally the pulse rate of the loaded filter tape is measured. The difference between the two pulse rates is evaluated in the device and displayed as dust concentration in µg/m³.

Options
Further sample inlets:
- PM-2.5 (accordant EN 12341)
- PM-10 (according to EN 12341)
- Total dust (according to VDI 2463)

| measurements | dust concentration | accuracy |<2% of measuring range
| measuring ranges | 0–0.1 ... 0–10 mg/m³ | detection limit | <0.001 mg/m³
| measuring principle | beta-ray absorption | reference point drift | <1% of measuring range/month
| ambient temperature | 0 up to +50°C | zero point drift | automatic zero point correction
| protection | IP20 | supply voltage | 230 VAC / 50 Hz, 110 V / 60 Hz, 400 VA
| measuring outputs | 2 x 0 / 4-20 mA / 500 Ohm | dimensions | 320 x 450 x 500 mm, 19"-rack mount / desk unit
| digital outputs | 8 relay outputs, permissible load 24 V, 12 VA | weight | 26 kg
| digital inputs | 3 potential free inputs | probe tube length | standard 2 m
| | | | 0.5–5 m possible
Total mercury analyser

Measuring device for fully-automatic and continuous mercury analysis in smoke gas (without wet chemistry).

Features

- Maintenance-free (6 months) dry reactor
- High operational safety
- Easy maintenance
- Low cross sensitivities
- Easily legible LC display.

Applications

- Waste incinerations (municipal waste, industrial waste, hospital waste)
- Sewage sludge incineration
- Hazardous waste incineration
- Steel plants with scrap metal preparation
- Contaminated soil burning plants
- Crematoriums
- Mercury mines and refineries
- Fluorescent light bulb recycling plants.

Approvals

- Suitability-tested by the TÜV Hamburg, test report 00 CU 014
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS pending.

Measuring principle

In the HM 1400 TR total mercury analyser the sample gas is converted into mercury vapour by a combination of thermal and dry chemical treatment. This is then continuously measured in a photometer. The probe gas flow is measured after a gas cooler at 2°C. The concentration is calculated and displayed as „dry flue gas“.

System components

- sampling probe
- sampling line
- measuring device.

Options

- Larger measuring range with dilution device
- Top-mounted cooling device
- Automatic probe back purging device, dilution device for gas sample
- Integrated system to generate calibration gas.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>total mercury</th>
<th>detection limit</th>
<th>&lt;1 µg/Nm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>measuring ranges</td>
<td>0–45 ... 0–500 µg/Nm³</td>
<td>reference point drift</td>
<td>&lt;2% of measuring range/month</td>
</tr>
<tr>
<td>measuring principle</td>
<td>UV-absorption</td>
<td>zero point drift</td>
<td>automatic zero correction</td>
</tr>
<tr>
<td>flue gas temperature</td>
<td>0–250 °C</td>
<td>supply voltage</td>
<td>230 VAC, 50 Hz, 1200 VA, sample probe: 650 VA, sample line: 100 VA/m</td>
</tr>
<tr>
<td>flue gas pressure</td>
<td>-50 up to +50 hPa</td>
<td>dimensions (h x w x d)</td>
<td>cabinet 1600 x 800 x 500 mm</td>
</tr>
<tr>
<td>duct diameter</td>
<td>&gt;0.5 m</td>
<td>weight</td>
<td>220 kg</td>
</tr>
<tr>
<td>ambient temperature</td>
<td>+5 bis +30°C</td>
<td>purge air supply</td>
<td>pressurized air 3–6 bar</td>
</tr>
<tr>
<td>protection</td>
<td>IP40 (IP55)</td>
<td>measuring outputs</td>
<td>2 x 0 / 4–20 mA/500 Ohm</td>
</tr>
<tr>
<td>digital outputs</td>
<td>4 relay outputs, permissable load 250 V, 100 VA</td>
<td>digital inputs</td>
<td>1 potential free outputs</td>
</tr>
<tr>
<td>accuracy</td>
<td>&lt;1% of measuring range</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Volume flow measuring system

Measuring system to measure flow rate in dry emissions with a probe using the differential pressure principle.

### Features
- Measurement of emission speed
- Calculation of volume flow at standard conditions with the evaluation unit D-FL 100-10 (optional)
- Adjustable parameters
- Automatic back purging device (optional)
- Versions with or without counter-support and for point measurement.

### Applications
- Volume flow measurement at high temperatures
- Plants with large or small flue cross-sections
- Volume flow measurement at high pressure.

### Approvals
- Suitability-tested by the TÜV Hamburg, test report 128CU11650
- Itemized in the list of suitable measuring devices for continuous emission measuring.
- MCERTS pending.

### Measuring principle
The D-FL 100 measuring system operates according to the differential pressure principle. The probe has two separate chambers, between which the flow builds up a differential pressure. Taking account of the other flow parameters such as, e.g. absolute pressure and temperature, the volume flow can be converted from operating to standard conditions with the help of the D-FL 100-10 microprocessor evaluation unit.

### Models
- **D-FL 100 probe assembly** with assembly of measuring transducer on the probe (not for probe 3)
- **D-FL 100 hose assembly** with the measuring transducer connection via hose line.

### System components
- Mounting flange
- Flow probe
- Counter-support
- Differential pressure transducer
- Cross-over cock
- Probe adapter.

### Options
- Microprocessor evaluation unit D-FL100-10
- Absolute pressure transducer
- Temperature transducer
- Weather protection covers
- Automatically controlled back purging device
- Special designs in other materials for applications with particularly aggressive exhaust gases or high gas temperatures
- dP-transducer in Ex-version.

### Probes
- Probe 1: 0.4–2 m
- Probe 2: up to 4 m
- Probe 3: up to 8 m.

### System components

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flue gas velocity, volume flow</td>
<td>&lt;2% of measuring range</td>
</tr>
<tr>
<td>Measuring ranges</td>
<td>Detection limit</td>
</tr>
<tr>
<td>0–3000000 m³/h / 3–40 m/s</td>
<td>&lt;3 m/s</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Reference point drift</td>
</tr>
<tr>
<td>Differential pressure</td>
<td>&lt;0.5% of measuring range/month</td>
</tr>
<tr>
<td>Flue gas temperature</td>
<td>Zero point drift</td>
</tr>
<tr>
<td>Above dew point up to 400 °C,</td>
<td>&lt;0.5% of measuring range</td>
</tr>
<tr>
<td>Optional up to 800 °C</td>
<td>Supply voltage</td>
</tr>
</tbody>
</table>
| Flue gas pressure             | 14–45 VDC, 115 / 230 VAC, 50 / 60 Hz, 50 VA | 1
| -700 up to 1000 hPa, optional higher | 2) probe: 380 x 160 x (300 + probe length) mm |
| Duct diameter                 | Dimensions        |
| 0.4–8 m                       | (h x w x d)       |
| Ambient temperature           | Weight            |
| -20 up to +50 °C              | 32 kg + 6.8 kg/m probe length |
| Protection                    | Purge air supply  |
| IP65, Ex optional             | 6–8 bar for back purging if necessary |
| Measuring outputs             | Remarks           |
| 0 / 4–20 mA / 500 Ohm         | Optional pressure and temperature correction |
| Digital outputs               | Only with evaluation unit |

### Notes
1) Optional pressure and temperature correction
2) Only with evaluation unit

---

**Diagram:**
- Differential pressure transducer
- Cross-over cock
- Flow probe
- Flow direction
- Microprocessor evaluation unit
- flue gas velocity, volume flow
- Measuring ranges
- Measuring principle
- Differential pressure
- Flue gas temperature
- Flue gas pressure
- Duct diameter
- Ambient temperature
- Protection
- Measuring outputs
- Digital outputs
- Remarks
Volume flow measuring system

Measuring system for ultra-sonic measuring of velocity and volume flow, especially for wet and aggressive smoke emissions (waste incineration).

Features
- In-situ measuring method
- Measurement possible below dew point and for high dust concentrations
- Continuous measurement of normal volume flow and gas velocity
- Automatic zero point and reference point control
- Direct connection for temperature and pressure correction
- Parameter input via keyboard or PC
- Continuous temperature measuring.

Applications
- Volume flow measuring at low speeds
- Plants with damp and/or aggressive exhaust gas, e.g. in waste incineration plants.
- Volume flow measurement at high dust content.

Approvals
- Suitability-tested by the TÜV Hamburg, test report 99CU019
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS pending.

Measuring principle
The D-FL 200 measuring system works according to the acoustic transit time differential method. Ultrasonic transducers mutually send and receive short pulses with and against the gas flow direction which affects their transit time. The volume flow is calculated from the difference of transit times.

System components
- 2 mounting flanges (Mat. 1.4571)
- 2 measuring heads
- Evaluation unit D-FL 200-10 with housing
- Purge air unit for cleaning and cooling the sensors.

Options
- Modbus interface
- Temperature transducer
- Absolute pressure transducer
- Weather protection covers
- Purge air sensor with potential free error contact.

D-FL 200

<table>
<thead>
<tr>
<th>Measurements</th>
<th>flue gas velocity, volume flow (^1), temperature</th>
<th>detection limit</th>
<th>&lt;0.3% of measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>measuring ranges</td>
<td>0–3000000 m(^3)/h / 0–40 m/s 0–400°C</td>
<td>reference point drift</td>
<td>&lt;0.3% of measuring range/month</td>
</tr>
<tr>
<td>measuring principle</td>
<td>acoustic propagation delay</td>
<td>zero point drift</td>
<td>&lt;0.2% of measuring range/month</td>
</tr>
<tr>
<td>flue gas temperature</td>
<td>0–200 °C, optional higher</td>
<td>supply voltage</td>
<td>115 / 230 VAC, 50 / 60 Hz, 50 VA</td>
</tr>
<tr>
<td>flue gas pressure</td>
<td>-50 up to +20 hPa, optional higher</td>
<td>dimensions (h x w x d)</td>
<td>190 x 570 mm</td>
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<tr>
<td>duct diameter</td>
<td>0.7–10 m, temperature dependent</td>
<td>weight</td>
<td>17 kg</td>
</tr>
<tr>
<td>ambient temperature</td>
<td>-20 up to +50 °C</td>
<td>remarks</td>
<td>(^1) optional pressure and temperature correction</td>
</tr>
<tr>
<td>protection</td>
<td>IP65</td>
<td>purge air supply</td>
<td></td>
</tr>
<tr>
<td>measuring outputs</td>
<td>2 x 0 / 4–20 mA / 500 Ohm, optional Modbus RTU (RS 485)</td>
<td>purge air quantity</td>
<td>approx. 80 m(^3)/h</td>
</tr>
<tr>
<td>digital outputs</td>
<td>3 relay outputs, permissible load 250 V, 100 VA</td>
<td>supply voltage</td>
<td>115 / 230 V, 50 / 60 Hz, 0.37 / 0.43 kW</td>
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<tr>
<td>digital inputs</td>
<td>none</td>
<td>dimensions weight</td>
<td>350 x 550 x 500 mm 12 kg</td>
</tr>
<tr>
<td>accuracy</td>
<td>&lt;2%</td>
<td>protection</td>
<td>IP54</td>
</tr>
</tbody>
</table>
Environmental and process data management system

Modular system for continuous acquisition, long-term storage, calculation and visualisation of environmental and process data.

Features
- Instrument for monitoring legally prescribed limit values and recording their observance
- Emission monitoring and remote data transmission to the authorities
- Adjustable to any plant size through to complete assessment of complex industrial sites
- Continuous monitoring of 1 to 320 components per system workstation
- Interconnection of any number of components via data networks.

Approvals
- Suitability-tested by the TÜV Munich, test report 24108990
- Itemized in the list of suitable systems for the evaluation of continuous emission measuring.

Measured data recording
- Analog/digital inputs
  - as sub-rack with intermediate data storage
  - or as local modules
- Data transmission via bus systems, Modbus, Profibus, TCP/IP or other interfaces.

Data sources
- Emission data
- Immission data
- Meteorological data
- Water data
- Process data.

Data export
- Data interface to MS-Excel with option of further measured data evaluation, e.g. for fulfillment of environmental protection officer’s reporting duties
- Measured data can be transferred to authorities via standard remote communication or via internet
- Merging of measured data e.g. for greenhouse emission trading
- Remote service interface for fast and cost effective service.

Data security
- Paperless data storage to replace recorders and printers is possible through integrated data security, which is guaranteed on several levels in the system
- Intermediate storage of the raw input values at minute intervals in data communication unit D-MS 500 KE
- Double data storage on two separate hard disks in a RAID1 set
- Storage of analog raw values at second intervals
- Data backup on external redundant drive.

Internet/Intranet connection
- Data transfer to an Internet server with HTML standard masks via standard software (MS-Internet-Explorer)
- Password-protected control of daily emission values including classification records.

Visualisation
- Measured data recording according to official regulations
- Classification tables, daily, monthly and annual records
- Representation of current, prognostic and historic measured data in bar/chart form
- Pollutant compensation, characteristics curve and correlation
- Automatic alarm and information system.
Software module for emission remote data transmission to the Internet

The state-of-the-art online information platform for the relevant authorities.

Features

- No separate web server necessary
- Visualisation of all data with standard browser MS Internet Explorer
- High security levels through password protection and ring memory
- Representation of protocols and tables in universal PDF format
- Authority and operator have the same protocols and tables
- Graphical/numerical representation of transmitted values
- Download for representation in MS Excel
- No operating and update costs for authorities.

Data transfer

- Data transfer occurs on a (half-) hourly basis so that authorities always have all values at hand, including the last integral
- With the transfer of average values, the agreed events (e.g. excess ELV, breakdown ARE) that occurred within the past 30 or 60 minutes are also provided
- Comment option by the operator
- The protocols are generated on the operator’s PC and transferred to the relevant Internet server in PDF format. This renders parallel archiving on an official server unnecessary
- All data are stored on an Internet server in dynamic ring memories over 24 months
- Visualisation and possible downloads are password-protected and free of charge for the authorities.

Overview site at http://www.durag.info

- Demonstration unit under „Durag Demo"
- The installed password-protected operator units can be opened via appropriate logos
- Country-specific official sites can be created upon the authority’s request.

Data transfer to Internet:

- Official classification protocol, daily protocol, monthly protocols
- Current (half-) hourly average values, events of the last 30 or 60 minutes
- Events, comments, news

Monthly log of April 2005

<table>
<thead>
<tr>
<th>D-EMS 2000 Emission Surveillance AVA Augsburg</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001/06/EC</td>
</tr>
<tr>
<td>B00-val</td>
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</tbody>
</table>

Daily log of 27 April 2005

<table>
<thead>
<tr>
<th>D-EMS 2000 Emission Surveillance AVA Augsburg</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001/06/EC</td>
</tr>
<tr>
<td>Time</td>
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<tr>
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<td>07:30</td>
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<tr>
<td>08:00</td>
</tr>
</tbody>
</table>

Protocols are generated automatically at the end of the day and stored on the server as PDF files.

Official (validated) half-hourly average values are listed in the daily protocol.

All daily average values are listed in the monthly protocol.

Line diagrams can be called up for clearly visible representation of average values.

Distribution protocol

- Air temperature and concentration from 28.01.2003 until 04.07.2003
- Daily distribution

The class frequency distribution is transmitted daily after midnight in PDF format as copy of the protocol generated by the operator.
Features

- DURAG D-EMS 2000 Environment and Process Data Management System Module, also available as a separate programme
- Drift and precision calculation for zero and AMS reference point
- Automatic import of current zero and reference point values of the AMS
- Manual input option for calculation of AMS required values without automatic zero and reference point control
- Automatic archiving and long-term storage of all generated CUSUM control cards for documentation within the frame of functional testing
- Graphical/numerical representation of all input data and calculations
- Complete AMS document management according to EN 14181 point 9 Appendix D
  - Identification of AMS (type, manufacturer, installation site, etc.)
  - Connection entries (activities, events, personnel, etc.)
  - Test reports
  - Calibration reports
  - Reports on interventions
  - Drawings (gas operational plans, connections, etc.)
  - Pictures (overall configuration, particularities, etc.)
  - Procedural instructions
  - Operating instructions
  - Staff qualifications.

Software for complete documentation of AMS, drift and precision (QAL3) according to EN 14181