HORIBA
Process & Environmental


# Stack-gas Analysis System

## ENDA 5000 series

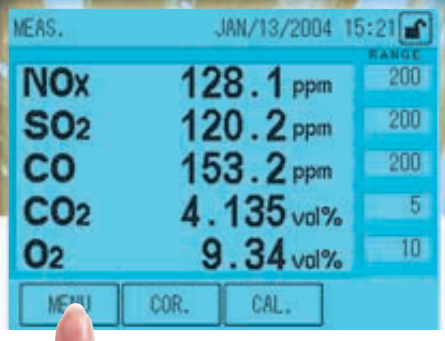
**$NO_x$, $SO_2$, CO, $CO_2$, $O_2$**
**Continuous simultaneous 5-component analysis**

**COMPACT**
Uses half the space of previous models.

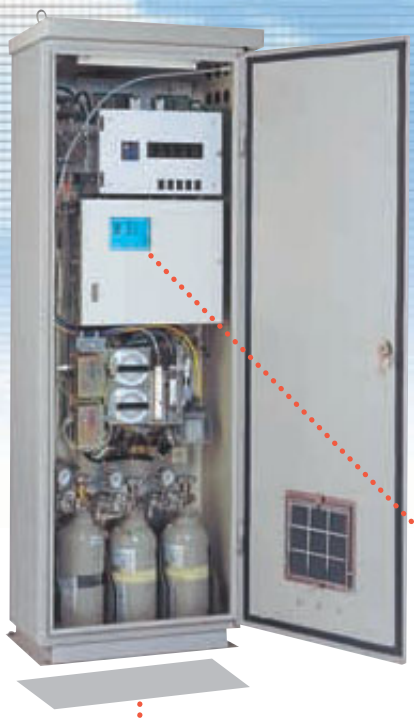
**EASY**
Features an intuitive touch panel.

**LONG-TERM STABILITY**
Uses NDIR for better long-term stability and reliability.

- Steam boilers
- Iron and steel processing
- Refuse incinerators
- Electric power generation plants
- Sulfuric acid plants
- Glass furnaces

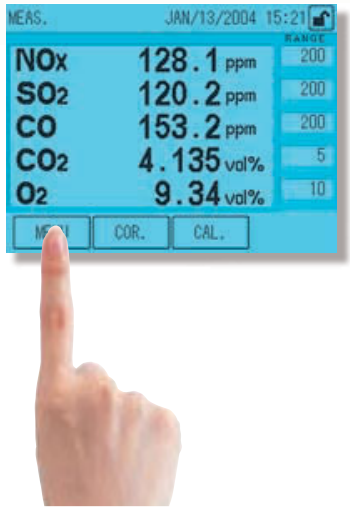


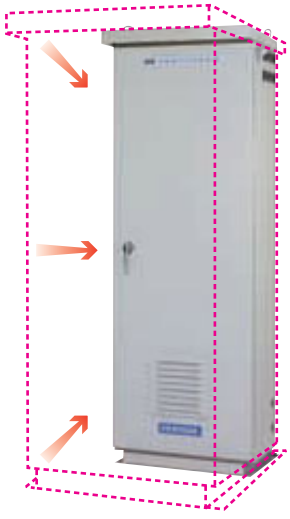
# The ENDA-5000 series of stack-gas analysis systems



## Continuous simultaneous and high-precision measurement of NOx, $SO_2$, CO, $CO_2$, and $O_2$

Over 100,000 systems installed and 30 years of quality and experience. That is the base on which HORIBA's ENDA-5000 series of stack-gas analysis systems is built. These systems have a smaller footprint, and use cross-flow modulated non-dispersive infrared (NDIR) detection with a magnet-pneumatic detection method that is inherently drift-free. The ENDA-5000 series are superior continuous analysis systems that are perfect in the difficult field of exhaust gas measurement, where measurement errors cannot be tolerated. The series features an intuitive touch panel that makes every operation available with the touch of a single button. The ENDA-5000 series are also designed for faster, more efficient maintenance. They are ideal for a variety of uses, including monitoring steam boiler, refuse incinerator, and electric power generation plant emissions to assure pollution standards are being met.



### COMPACT

Body yields wider maintenance area

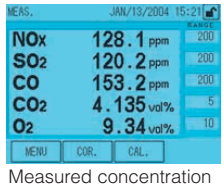
## Compact (all maintenance can be done from the front)

ENDA-5000 series is a total analysis system which each equipment is housed in a 30cm depth cabinet (3-cylinder type). Therefore, ENDA-5000 series can be installed almost anywhere, with ample room on all sides for easy access and much easier maintenance. The compact blowback panel for sampling is available as well. Downsizing of these equipments helps save space even when permanently installed, and free up valuable floor area for other equipment.

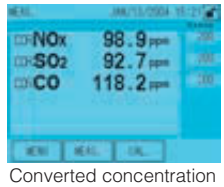
### EASY

Features an intuitive touch panel.

## Easy to use




Measured concentration




Converted concentration

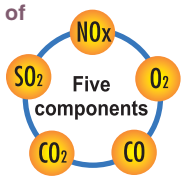
Correction history

Alarm history

The ENDA-5000 series use a large-format LCD touch panel that can display all five critical components (NOx, $SO_2$, CO, $CO_2$, $O_2$) simultaneously. The touch panel also allows the operator to view the density variations of multiple components at once.
The operator can easily switch between the corrected and converted density settings screens or view alert information with the touch of a single button.

### Continuous simultaneous measurement of up to five components with one system

HORIBA'S innovative optical technology enables ENDA-5000 series measure up to five components which can be arranged any combination.




### Correction for interference

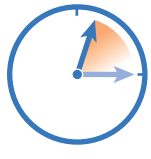
The interference correcting sensor uses a unique interference filter to compensate for the influence of interference by other gases.

### Better alerts and extra alerts

In addition to the alert functions available in the past, the ENDA-5000 series feature extra alert functions. A continuous checking process can prevent the unit from stopping due to a failure, reducing the risk of failed measurements and assuring consistent operation. US Patent No. 5,966,676

### Dramatically reduced correction time for $SO_2$

Corrections of $SO_2$ measurements using wet base methods of the past took a great deal of time (about 15 minutes), but with the ENDA-5000 series' dry base method, correction takes only three minutes.



# The ultimate in dependability and reliability

LONG-TERM STABILITY

**Cross-flow modulated non-dispersive infrared (NDIR) detection is renowned for long-term stability.**

## Long-term stability

### 1 No need for optical adjustments

With cross-flow modulated non-dispersive infrared (NDIR) detection, the sample gas and reference gas are intromitted into a single measurement cell alternately to obtain modulation signal. Therefore there is no need to adjust two different optical paths so that they are balanced.

### 2 A stable zero point

Since the ENDA-5000 series output the difference between the measured gas and the reference gas each time measurement occurs (once a second), the zero point is extremely stable.

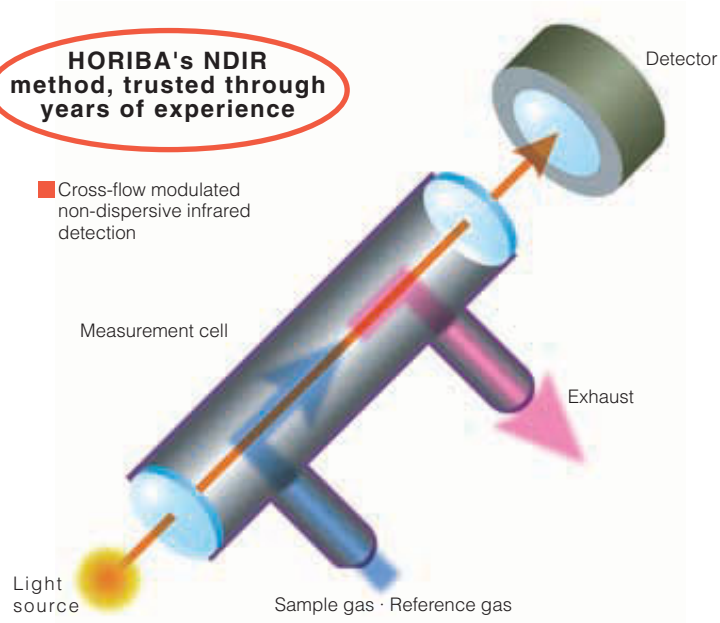
### 3 Continuous cleaning keeps the cell clean

Since cleaning air is fed into the sample cell in between each batch of sample gas, the cell resists contamination and normally remains clean. This reduces span drift and makes the equipment safe and stable for long periods of time.

### Other merits

- A $CO_2$ sensor constantly measures and makes corrections to compensate for $CO_2$ interference in NOx measurements.
- An interference compensation detector compensates for interference from $H_2O$ during NOx and $SO_2$ measurement.

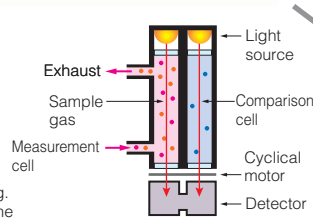
**HORIBA's NDIR method, trusted through years of experience**




〔Dual optical path comparison〕

**The sample gas and reference gas are each put in a different cell for measurement.**

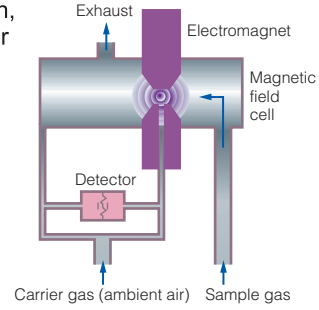
- This method is appropriate for laboratory use and other kinds of batch measurement.
- Differences in the cleanliness of the two optical paths result in signal variation.
- Keeping the cells clean requires periodic cleaning.
- During transport, and inspection, and whenever the unit is subject to vibrations, fine adjustment by a skilled service person is required.




Two optical path measurement

**With magneto-pneumatic detection, there is no need for cylinder carrier gas.**

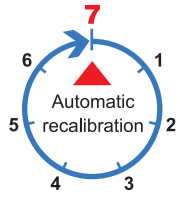
The ENDA-5000 series use magneto-pneumatic detection to measure $O_2$. Since the sample gas does not come into direct contact with the detector, there is no deterioration due to corrosion, which enables long-term stable operation. What's more, thanks to HORIBA's innovative technology, in which ambient air is used as a carrier gas, there is no need for a carrier gas supply, which translates into lower costs.




Measurement principle of magneto-pneumatic detection

**Continuous correction is provided by a sensor that is designed to detect $CO_2$ interference during NOx measurement.**

**The systems feature an automatic recalibration function that calibrates the system every seven days.**




**A variety of types functions (up to 12 kinds of output)**

- Instantaneous output (NOx, $SO_2$, CO, $CO_2$, $O_2$)
- $O_2$ calculated output values ($NO_2$, $SO_2$, CO)
- Moving average values (for one to four hours)

**Ambient air is used as the carrier gas, which allows for installation in smaller spaces and lower running costs.**

**Environmentally friendly thanks to lower electrical draw**

These systems use 25% less electricity (200 VA) than older similar models.

# offers options for a variety of uses, all based on HORIB

## Sampling sections

The ENDA-5000 series' sampling sections use cost-effective parts for maintenance, and offer a variety of sample gas conditioning systems, each suitable for a different kind of gas. HORIBA's know-how has created the best possible system for every type of sample gas measurement.

- Sample gas probe with easy-to-change filter element

Sample gas probe

- An innovative dehumidifying system minimizes loss of soluble components.
- A mist catcher in the sample flow path removes $SO_3$ and prevents damage and line blockage.
- Long-lasting, low-temperature (180°C) $NO_2 \rightarrow NO$ converter prevents corrosion.

### New pressure control *

The new pressure control method is compatible with Daily start-up and shut-down and other intermittent operations.

* Older models used a water filled pressure trap.

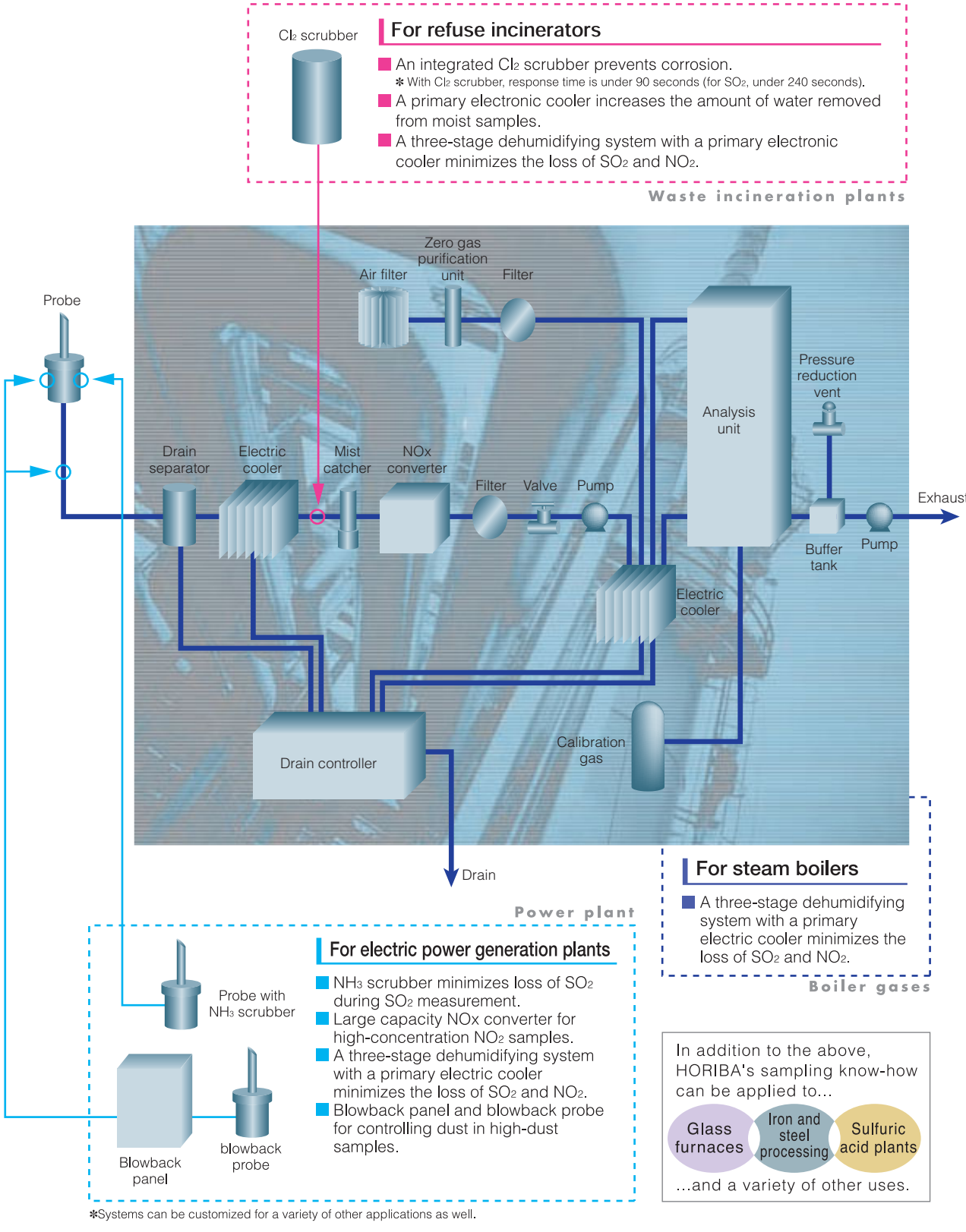
### Blowback panel reduced in size

In the past, a large blowback panel was necessary to control dust when measuring high-dust gas samples. HORIBA has used its innovative technology to reduce the size of the blowback panel by almost 25% (to 350 [W] x 550 [H] x 180 [D] mm). The panel is also lighter, and can be mounted on a wall. The new blowback panel can be used even in extremely small spaces.

## Models and components measured

| NOx | $SO_2$ | $CO_2$ | CO | $O_2$ | Model |
|---|---|---|---|---|---|
| ● | | | | | ENDA-5120 |
| | ● | | | | ENDA-5130 |
| | | ● | | | ENDA-5140 |
| | | | ● | | ENDA-5150 |
| | | | | ● | ENDA-5160 |
| ● | | | | ● | ENDA-5220 |
| | ● | | | ● | ENDA-5230 |
| | | ● | | ● | ENDA-5240 |
| | | | ● | ● | ENDA-5250 |
| ● | ● | | | | ENDA-5300 |
| ● | | ● | | | ENDA-5310 |
| ● | | | ● | | ENDA-5320 |
| | ● | ● | | | ENDA-5340 |
| | ● | | ● | | ENDA-5350 |
| | | ● | ● | | ENDA-5370 |
| ● | ● | | | ● | ENDA-5400 |
| ● | | ● | | ● | ENDA-5410 |
| ● | | | ● | ● | ENDA-5420 |
| | ● | ● | | ● | ENDA-5440 |
| | ● | | ● | ● | ENDA-5450 |
| | | ● | ● | ● | ENDA-5470 |
| ● | ● | ● | | | ENDA-5500 |
| ● | ● | | ● | | ENDA-5510 |
| ● | | ● | ● | | ENDA-5520 |
| | ● | ● | ● | | ENDA-5530 |
| ● | ● | ● | | ● | ENDA-5600 |
| ● | ● | | ● | ● | ENDA-5610 |
| ● | | ● | ● | ● | ENDA-5620 |
| | ● | ● | ● | ● | ENDA-5630 |
| ● | ● | ● | ● | | ENDA-5700 |
| ● | ● | ● | ● | ● | ENDA-5800 |

# A's extensive know-how.




*Systems can be customized for a variety of other applications as well.

## Specifications

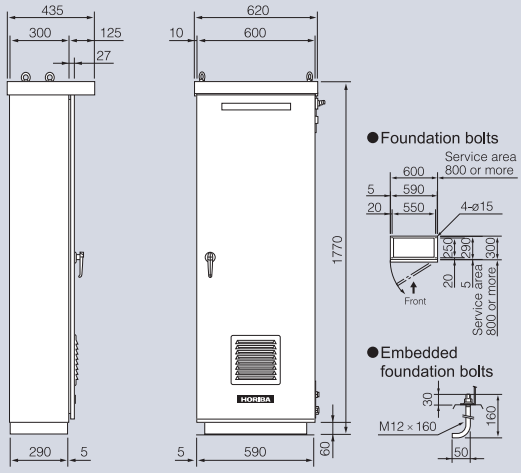
| Model | | ENDA-5000 | | | | |
|---|---|---|---|---|---|---|
| Component | | NOx | $SO_2$ | CO *1 | $CO_2$ | $O_2$ *2 |
| Measurement methods | | NDIR | NDIR | NDIR | NDIR | Magneto-pneumatic detection |
| Range | Standard | 200~5000 ppm | 200~5000 ppm | 200~5000 ppm | 5~25 vol% | 10~25 vol% |
| | Option | 100 ppm~ | 50 ppm~ | 100 ppm~ | — | — |
| Range Ratio | | Within a factor of 10 | Within a factor of 10 | Within a factor of 10 | Within a factor of 5 | Within a factor of 2.5 |
| Repeatability | | Within 0.5% of full scale (with optional range, or during $O_2$ measurement, ±1.0% of full scale) | | | | |
| Linearity (indicator error) | | ± 1.0% of full scale | | | | |
| Zero drift | | ± 1.0% of full scale/week (assuming surrounding temperature is maintained within 5°C) (with optional range, or $O_2$ measurement, ± 2.0% of full scale/week ) | | | | |
| Span drift | | ± 2.0% of full scale/week (assuming surrounding temperature is maintained within 5°C) | | | | |
| Response time | | Within 60 seconds (Td + $T_{90}$ from equipment intake area) (sample flow 0.6 L/min.) (within 240 seconds for $SO_2$ only) | | | | |
| Interference | | ± 2.0% of full scale (within standard range, with standard gas formation) | | | | |
| Display | | Touch panel LCD (backlight) (four usable lines) | | | | |
| Environment Condition | Temperature | -5 to 40°C (away from direct sunlight and radiation heat ) *3 | | | | |
| | Humidity | 90% or less (no condensation) | | | | |
| | Vibration | 100 Hz, 0.3 $m/s^2$ or less | | | | |
| | Dust | Standard environment or better | | | | |
| Measuring Gas Condition | Temperature | 250°C or lower | | | | |
| | Dust | 0.1 $g/Nm^3$ or less | | | | |
| | Standard gas composition *4 | NO: 500 ppm or less; $NO_2$: 15 ppm or less; $SO_2$: 1000 ppm or less; $SO_3$: 50 ppm or less; CO: 200 ppm or less; $CO_2$: 15 vol% or less; $H_2O$: 20 vol% or less | | | | |
| Sampling method | | Dry sampling using an electric cooler | | | | |
| Sample gas flow | | 2.5 L/min~3.0 L/min | | | | |
| Sample inlet tube | | PTFE tubing (ø8/ø6 mm) | | | | |
| Sample gas pressure | | ± 4.9 kPa (three points selected) (with no sample gas back pressure) | (1) -1.96 to 4.9 kPa (2) ± 3.43 kPa (3) -4.9 to 1.96 kPa | | | |
| Pressure control | | Pressure control uses a regulator and pump; Reduced pressure sampling; Control pressure: -4.9 kPa | | | | |
| Output | | DC 4 to 20 mA (absolute output) (DC 0 to 16 mA/DC 0 to 1 V/DC 1 to 5V optional) Max. 12 output systems | | | | |
| External output | | Analysis alerts, analysis warnings, range display, corrections, conservation, purging (option) Contact capacity: DC 30 V 1 A, AC 250 V 1 A resistance load | | | | |
| Correction method | | Dry correction, automatic correction (correction cycle: 7 days standard, can be adjusted to between 1 and 99 days), manual correction | | | | |
| Calibration gas | Zero gas | With measurement method authorization: $N_2$, When there is no measurement method authorization: $N_2$ or ambient air | | | | |
| | $O_2$ carrier gas | Ambient air | | | | |
| | Span gas | Gas cylinder for each component measured (when there is no measurement method authorization: $O_2$ or ambient air can be used) | | | | |
| Probe | | Flange: JIS 10K, 40 AFF; Sample probe tube length: 1000 mm; Material: SUS-316 stainless steel; | | | | |
| Primary filter | | Filter element: SUS-304 stainless steel and 2µm-pleated quartz wool; Electric heater: 100 VA, with water droplet proof case | | | | |
| Power supply | | AC 100 V ± 15 V(85 V~115 V) | | | | |
| Power frequency | | 50/60 Hz (switchable) | | | | |
| Power consumption | | About 800 VA (heated piping 30m: +1100 VA; heater in tray: +300 VA) | | | | |
| Exterior dimensions /Mass | | 600 (W) x 1770 (H) x 300 (D) mm (high pressure gas cylinders, 3.4 L cylinders, maximum of 3 cylinders); About 180 kg (not including cylinders)<br>600 (W) x 1770 (H) x 500 (D) mm (high pressure gas cylinders, 3.4 L cylinders, maximum of 6 cylinders); About 200 kg (not including cylinders) | | | | |
| Materials in contract with sample gas | | SUS-316 stainless steel, SUS-304 stainless steel, PTFE, polypropylene, polyethylene, fluororubber, PVC, PVDF, and glass | | | | |
| Enclosure | | Independent outdoor installation<br>Plate thickness: Main unit, doors, top plate, steel plate: 2.3 mm; Channel base: 3.2 mm; Doors: front opening; Interface: right front | | | | |
| Color/Finish | | Semi-gloss Munsell 5Y7/1 on all inner and outer surfaces | | | | |

*1: The analyzer against $N_2$0 interference for CO analyzer applies the standard range of 200 ppm or more (no optional range).
*2: No carrier gas cylinder is necessary.
*3: For the temperature range of -15°C to 40°C (cold district) and for the specification of -5°C to 50°C, we will separately discuss the design.
*4: When the coexisting gas contains $NH_3$, $NH_3$ scrubber is prepared for an optional part.
When $CH_4$ coexists in the sample gas for $SO_2$ analyzer, the $SO_2$ analyzer of $CH_4$ interference compensation type is prepared. When $N_2O$ coexists in the sample gas for CO analyzer, the CO analyzer of $N_2O$ interference compensation type is prepared.

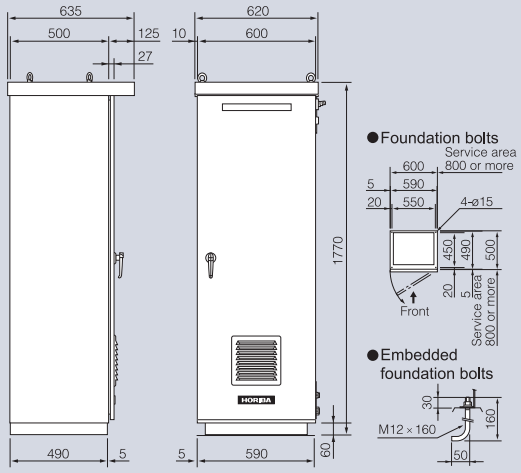
## Dimensions (unit: mm)

*Up to five components are supported if cylinders are mounted externally.

〔 3-cylinder type 〕




〔 6-cylinder type 〕




The EMC Directive : EN61326 Compliant
European Standard compliant : EN15267, EN14181
Pattern Approved, Metrology Law (China) : 2006-C118

**IMS**

The HORIBA Group adopts IMS (Integrated Management System) which integrates Quality Management System ISO9001, Environmental Management System ISO14001, and Occupational Health and Safety Management System OHSAS18001.
We have now integrated Business Continuity Management System ISO22301 in order to provide our products and services in a stable manner, even in emergencies.

**Please read the operation manual before using this product to assure safe and proper handling of the product.**

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Bulletin:HRE-2406D

Printed in Japan 1601SK33

# PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

## *ENDA-5000 Series*
## *Stack Gas Analysis System*

Manufactured by:

## *Horiba GmbH*
Kaplanstrasse 5
A-3430 Tulln
Austria

Has been assessed by Sira Certification Service
And for the conditions stated on this certificate complies with:

**MCERTS Performance Standards for Continuous Emission Monitoring Systems, Version 3.5 dated June 2016**
**EN15267-3:2007,**
& QAL 1 as defined in EN 14181: 2004

Certification Ranges :

| | | |
|---|---|---|
| CO | 0 to 50 mg/m$^3$ | 0 to 500 mg/m$^3$ |
| $NO_x$ | 0 to 100 mg/m$^3$ | 0 to 1000 mg/m$^3$ |
| $SO_2$ | 0 to 75 mg/m$^3$ | 0 to 750 mg/m$^3$ |
| $CO_2$ | 0 to 20 Vol.-% | |
| $O_2$ | 0 to 25 Vol.-% | |

| | |
|---|---|
| Project No.: | 16A28926/7017426 |
| Certificate No: | Sira MC 120212/02 |
| Initial Certification: | 26 November 2012 |
| This Certificate issued: | 28 February 2018 |
| Renewal Date: | 25 November 2022 |

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Certification Manager

MCERTS is operated on behalf of the Environment Agency by

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## Approved Site Application

*Any potential user should ensure, in consultation with the manufacturer, that the monitoring system is suitable for the intended application. For general guidance on monitoring techniques refer to the Environment Agency Monitoring Technical Guidance Notes available at [www.mcerts.net](http://www.mcerts.net)*

On the basis of the assessment and the ranges required for compliance with EU Directives this instrument is considered suitable for use on waste incineration and large coal-fired combustion plant applications. This CEM has been proven suitable for its measuring task (parameter and composition of the flue gas) by use of the QAL 1 procedure specified in EN14181, for LCPD and WID applications for the ranges specified. The lowest certified range for each determinand shall not be more than 1.5X the daily average emission limit value (ELV) for WID applications, and not more than 2.5X the ELV for LCPD and other types of application.

The field test was conducted on a municipal waste incineration plant downstream of the exhaust gas cleaning system for 8 months, between 13th May 2011 and 26th January 2012.

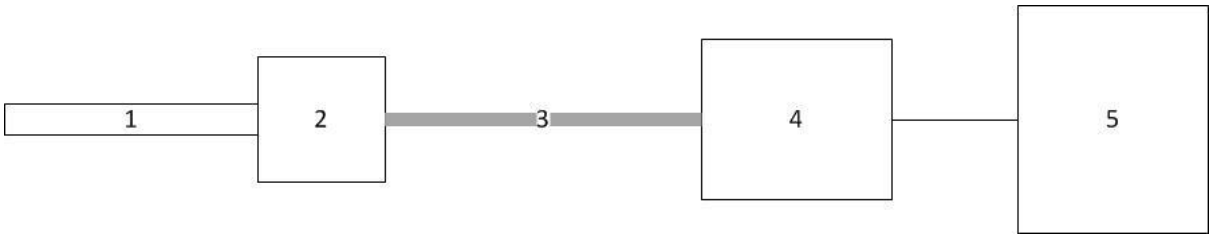
## Basis of Certification

This certification is based on the following Test Report(s) and on Sira's assessment and ongoing surveillance of the product and the manufacturing process:

- TUV Report No. 936/21218525/A_en dated 20/03/2012
- QAL 1 Test Report for HORIBA ENDA 5000 Multi Gas Analyser – Corrected Tables for Lack-of-fit test in the field.

## Product Certified

The Horiba ENDA-5000 series Stack Gas Analysis System consists of the following parts:




| 1. Sample Probe | 2. Heated Filter | 3. Heated Sample Line | 4. Gas Conditioning | 5. Analyser |
|---|---|---|---|---|
| Model:<br>M&C PSP 4000-H | Model:<br>N/A - Integrated with sampling probe | Model:<br>RACO<br>Sample Line Length: 10m | Model:<br>ENDA-5000 | Model:<br>ENDA-5000 with CMA-5800 Analysing module |

This certificate applies to all instruments fitted with software version P1000877001I (serial number 0900500 onwards).

## Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: 5°C to 40°C
Instrument IP rating: IP54

Results are expressed as % of the certification range, unless otherwise stated. O2 results are reported as %vol.

| Test | Results expressed as % of the certification range | | | | Other results | MCERTS specification |
|---|---|---|---|---|---|---|
| | <0.5 | <1 | <2 | <5 | | |
| Response time | | | | | | |
| $NO_x$ | | | | | 60s | <200s |
| $SO_2$ | | | | | 117s | <200s |
| CO | | | | | 64s | <200s |
| $CO_2$ | | | | | 64s | <200s |
| $O_2$ | | | | | 57s | <200s |
| Repeatability standard deviation at zero point | | | | | | |
| $NO_x$ | 0.1 | | | | | <2.0% |
| $SO_2$ | 0.1 | | | | | <2.0% |
| CO | | 0.6 | | | | <2.0% |
| $CO_2$ | 0.0 | | | | | <2.0% |
| $O_2$ | 0.01 | | | | | <0.2% |
| Repeatability standard deviation at reference point | | | | | | |
| $NO_x$ | 0.2 | | | | | <2.0% |
| $SO_2$ | 0.2 | | | | | <2.0% |
| CO | | | 1.3 | | | <2.0% |
| $CO_2$ | 1.0 | | | | | <2.0% |
| $O_2$ | 0.02 | | | | | <0.2% |

| Test | Results expressed as % of the certification range | | | | Other results | MCERTS specification |
|---|---|---|---|---|---|---|
| | <0.5 | <1 | <2 | <5 | | |
| Lack-of-fit | | | | | | |
| $NO_x$ | 0.3 | | | | | <2.0% |
| $SO_2$ | | 0.8 | | | | <2.0% |
| CO | | 0.6 | | | | <2.0% |
| $CO_2$ | | | 1.0 | | | <2.0% |
| $O_2$ | 0.07 | | | | | <0.2% |
| Influence of ambient temperature zero point | | | | | | |
| $NO_x$ | | -0.5 | | | | <5.0% |
| $SO_2$ | | | | -2.3 | | <5.0% |
| CO | | 0.5 | | | | <5.0% |
| $CO_2$ | -0.2 | | | | | <5.0% |
| $O_2$ | 0.43 | | | | | <0.5% |
| Influence of ambient temperature reference point | | | | | | |
| $NO_x$ | | | 1.9 | | | <5.0% |
| $SO_2$ | | | | -2.0 | | <5.0% |
| CO | | | | 2.4 | | <5.0% |
| $CO_2$ | | | 1.0 | | | <5.0% |
| $O_2$ | 0.11 | | | | | <0.5% |

| Test | Results expressed as % of the certification range | | | | Other results | MCERTS specification |
|---|---|---|---|---|---|---|
| | <0.5 | <1 | <2 | <5 | | |
| Influence of sample gas flow for extractive CEMS | | | | | | |
| $NO_x$ | 0.4 | | | | | <2.0% |
| $SO_2$ | 0.1 | | | | | <2.0% |
| CO | -0.1 | | | | | <2.0% |
| $CO_2$ | 0.1 | | | | | <2.0% |
| $O_2$ | 0.07 | | | | | <0.2% |
| Influence of voltage variations 190 to 250V | | | | | | |
| $NO_x$ | | -0.9 | | | | <2.0% |
| $SO_2$ | | | -1.0 | | | <2.0% |
| CO | | 0.5 | | | | <2.0% |
| $CO_2$ | | -0.6 | | | | <2.0% |
| $O_2$ | 0.04 | | | | | <0.2% |
| Influence of vibration (10 to 60Hz (±0.3mm), 60 to 150Hz at 19.6m/s$^2$) | | | | | Not applicable for extractive CEMS. | To be reported |
| Cross-sensitivity at zero with interferents: $O_2$, $H_2O$, CO, $CO_2$, $CH_4$, $N_2O$, NO, $NO_2$, $NH_3$, $SO_2$, HCl | | | | | | |
| $NO_x$ | | | 1.96 | | | <4.0% |
| $SO_2$ | | | | 3.80 | | <4.0% |
| CO | | | | 2.46 | | <4.0% |
| $CO_2$ | <0.5 | | | | | <4.0% |
| $O_2$ | <0.1 | | | | | <0.4% |
| Cross-sensitivity at reference with interferents: $O_2$, $H_2O$, CO, $CO_2$, $CH_4$, $N_2O$, NO, $NO_2$, $NH_3$, $SO_2$, HCl | | | | | | |
| $NO_x$ | | | | 3.00 | | <4.0% |
| $SO_2$ | | | | 3.73 | | <4.0% |
| CO | | | | 2.60 | | <4.0% |
| $CO_2$ | | -0.95 | | | | <4.0% |
| $O_2$ | -0.19 | | | | | <0.4% |
| Converter Efficiency | | | | | 97.6% | >95% |

| Test | Results expressed as % of the certification range | | | | Other results | MCERTS specification |
|---|---|---|---|---|---|---|
| | <0.5 | <1 | <2 | <5 | | |
| Measurement uncertainty | | | | | | |
| $NO_x$ | | | | | 5.1% | Guidance - at least 25% below max permissible uncertainty |
| $SO_2$ | | | | | 8.8% | |
| CO | | | | | 5.6% | |
| $CO_2$ | | | | | 4.1% | |
| $O_2$ | | | | | 2.3% | |
| Calibration function (field) | | | | | | |
| $NO_x$ | | | | | 0.9967 | >0.90 |
| $SO_2$ | | | | | 0.9960 | >0.90 |
| CO | | | | | 0.9148 | >0.90 |
| $CO_2$ | | | | | 0.9788 | >0.90 |
| $O_2$ | | | | | 0.9994 | >0.90 |
| Response time (field) | | | | | | |
| $NO_x$ | | | | | 67s | <200s |
| $SO_2$ | | | | | 98s | <200s |
| CO | | | | | 54s | <200s |
| $CO_2$ | | | | | 58s | <200s |
| $O_2$ | | | | | 57s | <200s |
| Lack of fit (field) | | | | | | |
| $NO_x$ | 0.3 | | | | | <2.0% |
| $SO_2$ | -0.47 | | | | | <2.0% |
| CO | 0.4 | | | | | <2.0% |
| $CO_2$ | | | -1.8 | | | <2.0% |
| $O_2$ | 0.1 | | | | | <0.2% |
| Maintenance interval | | | | | 3 Months | Note 1 >8 days |

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This Certificate issued : 28 February 2018

| Test | Results expressed as % of the certification range | | | | Other results | MCERTS specification |
|---|---|---|---|---|---|---|
| | <0.5 | <1 | <2 | <5 | | |
| Zero and Span drift requirement | The Horiba ENDA-5000 system is an extractive system that uses various particulate filters to protect the optical system from contamination. The recommendations of the manufacturer with regard to filter changes should be followed. No compensation for zero and span drift is employed. Drift can be determined from normal automatic or manual zero and span checks. | | | | | Clause 6.13 & 10.13<br>Manufacturer shall provide a description of the technique to determine and compensate for zero and span drift. |
| Change in zero point over maintenance interval | | | | | | |
| $NO_x$ | | -0.94 | | | | <3.0% |
| $SO_2$ | | | -1.44 | | | <3.0% |
| CO | | 0.50 | | | | <3.0% |
| $CO_2$ | | -0.63 | | | | <3.0% |
| $O_2$ | 0.19 | | | | | <0.2% |
| Change in reference point over maintenance interval | | | | | | |
| $NO_x$ | | | | -2.81 | | <3.0% |
| $SO_2$ | | | 1.81 | | | <3.0% |
| CO | | | | 2.25 | | <3.0% |
| $CO_2$ | | | | 2.69 | | <3.0% |
| $O_2$ | 0.16 | | | | | <0.2% |
| Availability | | | | | 99.1% | >95%<br>(>98% for $O_2$) |
| Reproducibility | | | | | | |
| $NO_x$ | | 0.7 | | | | <3.3% |
| $SO_2$ | | | 1.1 | | | <3.3% |
| CO | | | 1.7 | | | <3.3% |
| $CO_2$ | | 0.9 | | | | <3.3% |
| $O_2$ | 0.19 | | | | | <0.2% |

Note 1: The ENDA 5000 Series Gas Analyser has a maintenance interval of 3 months. The work detailed below has to be carried out at regular intervals, depending on local conditions:

QAL3 activities in accordance with EN 14181 require monthly zero and span point checks for the component $CO_2$. It has been noted that container volumes for phosphoric acid collectors need to be adjusted for a three months maintenance

interval. It should be at least 120L. If smaller containers are used, these should be checked more often and refilled as the case may be.

## Description

The Horiba ENDA-5000 system is an extractive emission analysis system. This comprises a heated sample probe and filter, heated line, sample conditioning system and an analyser module for the measurement of up to five components. Carbon Monoxide, Carbon Dioxide, Oxides of Nitrogen, Sulphur Dioxide are measured by non-dispersive infra-red absorption (NDIR) and Oxygen by magneto-pneumatic method which does not require a carrier gas from a gas cylinder.
The sample conditioning system and analyser module are contained in a single unit with controller for the heated sample line.

## General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this Certificate. The Manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management system shall be subject to regular surveillance according to 'Regulations Applicable to the Holders of Sira Certificates'. The design of the product certified is defined in the Sira Design Schedule for certificate No. Sira MC 120212/00

2. If certified product is found not to comply, Sira Certification Service should be notified immediately at the address shown on this certificate.

3. The Certification Marks that can be applied to the product or used in publicity material are defined in 'Regulations Applicable to the Holders of Sira Certificates'.

4. This document remains the property of Sira and shall be returned when requested by the company.