



## Stack-gas Analysis System ENDA 5000 series

**NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>**  
Continuous simultaneous 5-component analysis

**C**OMPACT

Uses half the space of previous models.

**E**ASY

Features an intuitive touch panel.

**L**ONG-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

MEAS.		JAN/13/2004 15:21	
			RANGE
NO <sub>x</sub>	128.1 ppm		200
SO <sub>2</sub>	120.2 ppm		200
CO	153.2 ppm		200
CO <sub>2</sub>	4.135 vol%		5
O <sub>2</sub>	9.34 vol%		10

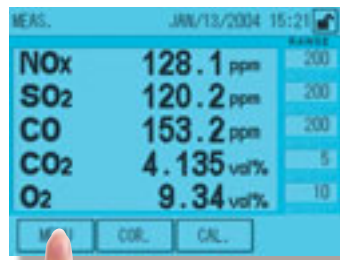
Buttons: MENU, COR., CAL.

# The Ultimate in Dependability and Reliability



## Continuous simultaneous and high-precision measurement of NOx, SO<sub>2</sub>, CO, CO<sub>2</sub>, and O<sub>2</sub>

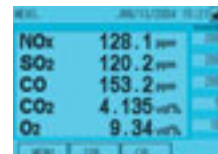
Over 100,000 systems installed and 30 years of quality and experience. That is the base on which HORIBA's ENDA-5000 series of stack-gas analysis systems is built. These systems have a smaller footprint, and use cross-flow modulated non-dispersive infrared (NDIR) detection with a magnet-pneumatic detection 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.



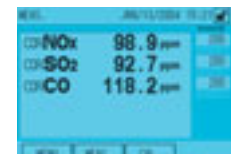
## EASY

Features an intuitive touch panel.

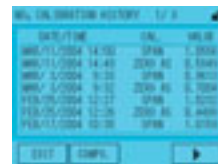
## Easy to use



Measured concentration



Converted concentration



Correction history



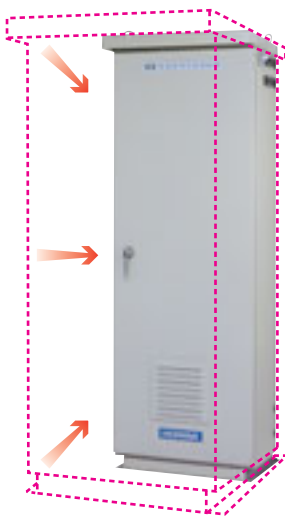
Alarm history

The ENDA-5000 series use a large-format LCD touch panel that can display all five critical components (NOx, SO<sub>2</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>) 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.

## COMPACT

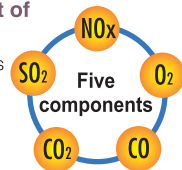
Body yields wider maintenance area  
**Compact** (all maintenance can be done from the front)

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.



### 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.



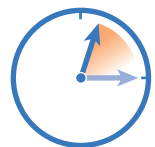
### Better alerts and extra alerts

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.



### Dramatically reduced correction time for SO<sub>2</sub>

Corrections of SO<sub>2</sub> 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.



## L 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 intrmitted 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

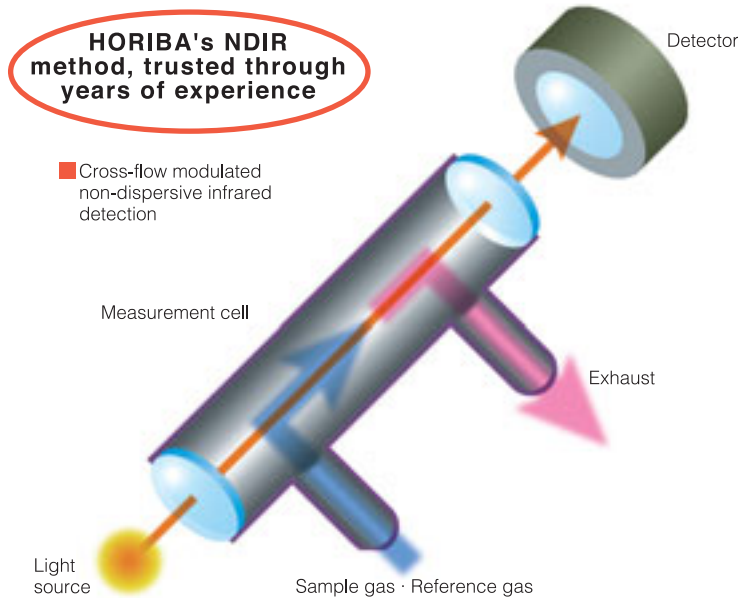
Since the ENDA-5000 series output the difference between the measured gas and the reference gas each time measurement occurs (once a second), the zero point is extremely stable.

#### 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

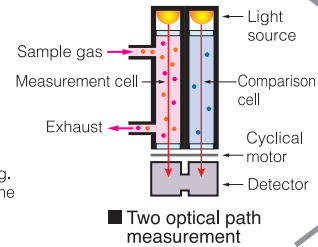
- A CO<sub>2</sub> sensor constantly measures and makes corrections to compensate for CO<sub>2</sub> interference in NO<sub>x</sub> measurements.
- An interference compensation detector compensates for interference from H<sub>2</sub>O during NO<sub>x</sub> and SO<sub>2</sub> measurement.



#### ( Dual optical path comparison )

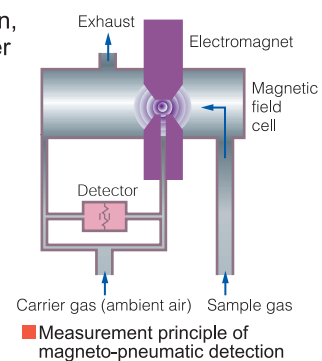
The sample gas and reference gas are each put in a different cell for measurement.

- » 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.



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

The ENDA-5000 series use magneto-pneumatic detection to measure O<sub>2</sub>. 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



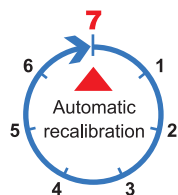
■ Continuous correction is provided by a sensor that is designed to detect CO<sub>2</sub> interference during NO<sub>x</sub> measurement.

■ 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 (NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>)
- O<sub>2</sub> calculated output values (NO<sub>2</sub>, SO<sub>2</sub>, 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.



# The ENDA-5000 series of stack-gas analysis systems offers options for a variety of uses, all based on HOR

## 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<sub>3</sub> and prevents damage and line blockage.
- Long-lasting, low-temperature (180°C) NO<sub>2</sub> → 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



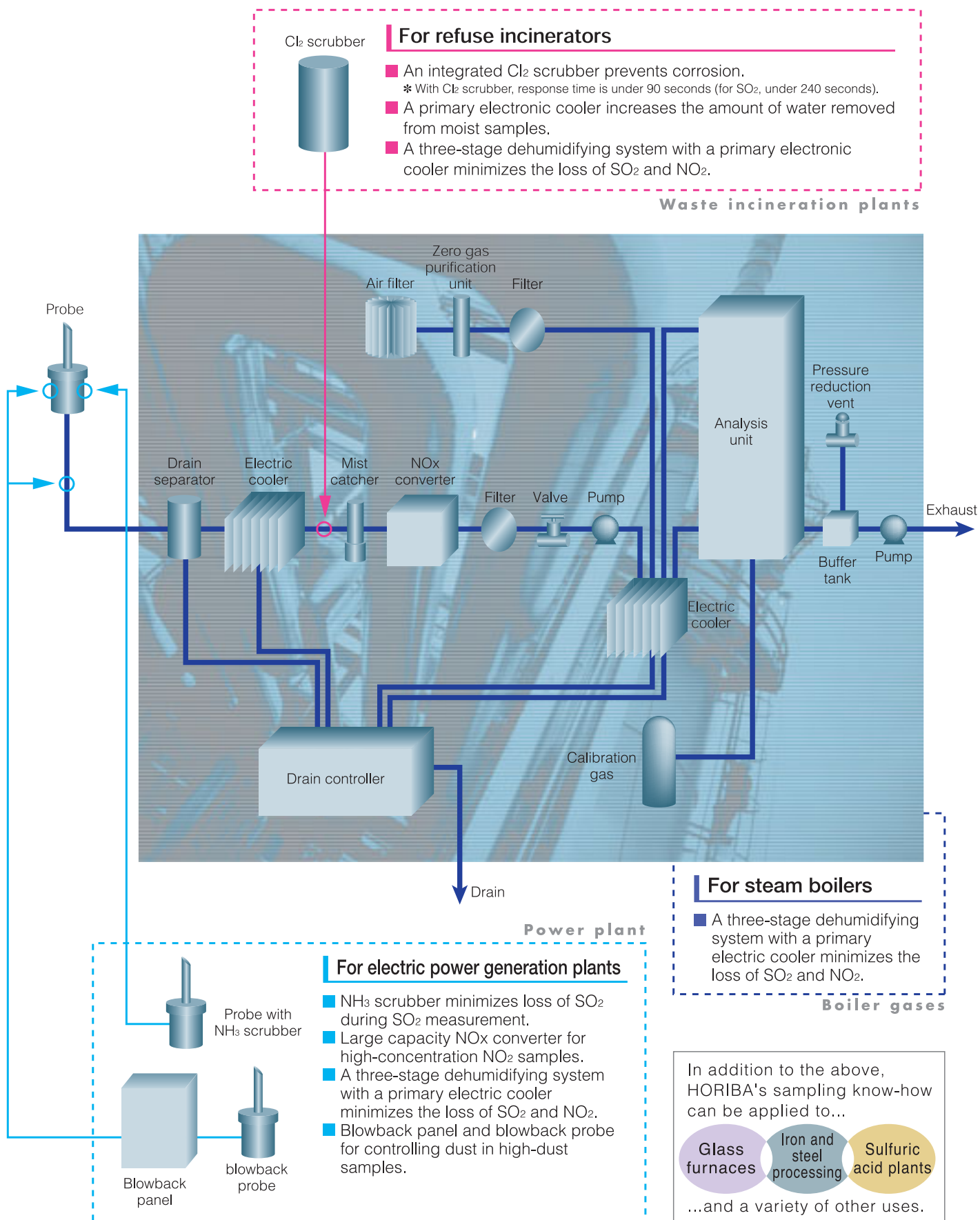
In the past, a large blowback panel was necessary to control dust when measuring high-dust gas samples. HORIBA has used its innovative technology to reduce the size of the blowback panel by almost 25% (to 350 [W] x 550 [H] x 180 [D] mm). The panel is also lighter, and can be mounted on a wall. The new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



## Models and components measured

NO <sub>x</sub>	SO <sub>2</sub>	CO <sub>2</sub>	CO	O <sub>2</sub>	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

# IBA's extensive know-how.



**For refuse incinerators**

- An integrated Cl<sub>2</sub> scrubber prevents corrosion.
  - \* With Cl<sub>2</sub> scrubber, response time is under 90 seconds (for SO<sub>2</sub>, under 240 seconds).
- A primary electronic cooler increases the amount of water removed from moist samples.
- A three-stage dehumidifying system with a primary electronic cooler minimizes the loss of SO<sub>2</sub> and NO<sub>2</sub>.

## Waste incineration plants

## For steam boilers

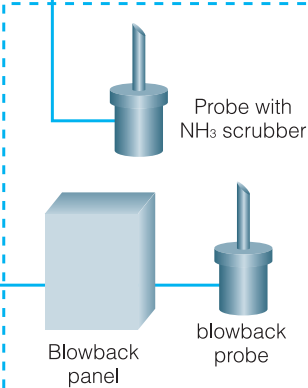
- A three-stage dehumidifying system with a primary electric cooler minimizes the loss of SO<sub>2</sub> and NO<sub>2</sub>.

## Boiler gases

## Power plant

## For electric power generation plants

- NH<sub>3</sub> scrubber minimizes loss of SO<sub>2</sub> during SO<sub>2</sub> measurement.
- Large capacity NO<sub>x</sub> converter for high-concentration NO<sub>2</sub> samples.
- A three-stage dehumidifying system with a primary electric cooler minimizes the loss of SO<sub>2</sub> and NO<sub>2</sub>.
- Blowback panel and blowback probe for controlling dust in high-dust samples.



In addition to the above, HORIBA's sampling know-how can be applied to...

- Glass furnaces
- Iron and steel processing
- Sulfuric acid plants

...and a variety of other uses.

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

# Lineup of HORIBA Combustion Exhaust Gas Measure

In both combustion gas analysis, which requires accuracy and stability, and stack exhaust gas analysis, which requires long-term stability, sampling technology which makes the most of sophisticated detection technology is indispensable.

Adding our engineering capability to over 30 years of HORIBA analysis technology, HORIBA provides all the components necessary in combustion exhaust gas analysis.

## Product Lineup

### 1 Stack Gas Analysis System

#### ENDA-5000 Series



##### Measured components / Range

NOx: 200-5000 ppm  
SO<sub>2</sub>: 200-5000 ppm  
CO: 200-5000 ppm  
CO<sub>2</sub>: 5-25 vol%  
O<sub>2</sub>: 10-25 vol%

##### Principle

Cross-flow modulated non-dispersive infrared (NDIR) (NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub>)  
Magneto-pneumatic detection (O<sub>2</sub>)

##### Sampling Method

Dry Extractive

##### Equipment Configuration

Probe, Heated Sample Line, Analyzers

### 2 Tunable Laser Hydrogen Chloride Analyzer

#### TX-100



##### Measured components / Range

HCl: 0-500 ppm  
H<sub>2</sub>O: 0-50%

##### Principle

Non Dispersive Infrared (NDIR)

##### Sampling Method

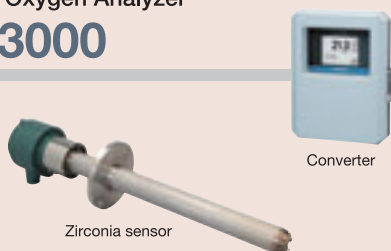
In-situ Probe

##### Equipment Configuration

Probe, Analyzer

### 3 Zirconia Oxygen Analyzer

#### NZ-3000



Zirconia sensor

Converter

##### Measured components / Range

O<sub>2</sub>: 0-100 vol%O<sub>2</sub>

##### Principle

Zirconia method

##### Sampling Method

In-situ Probe

##### Equipment Configuration

Converter, Zirconia sensor

### Portable Gas Analyzer

#### PG-300 Series



##### Measured components

NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>

##### Principle

Chemiluminescence  
Non-Dispersive Infrared  
Paramagnetic  
Zirconia  
Galvanic

##### Sampling Method

Dry Extractive

### 4 Dust concentration and opacity monitor

Continuously measures the dust concentration in combustion exhaust gas, such as at thermal power stations or waste incineration plants.

#### Data collection system

Collects, Records, Trends data, Alarms and Reports results via Plant Network Connections.

### 5 Flow meter

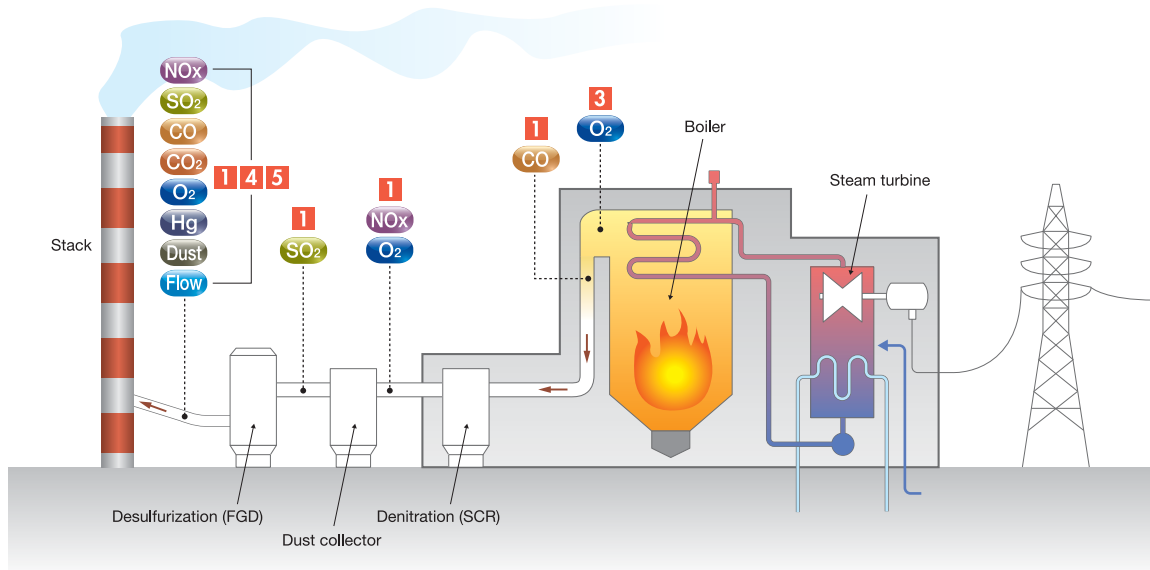
Continuously measures the flow rate of exhaust gases.

#### Large storage board

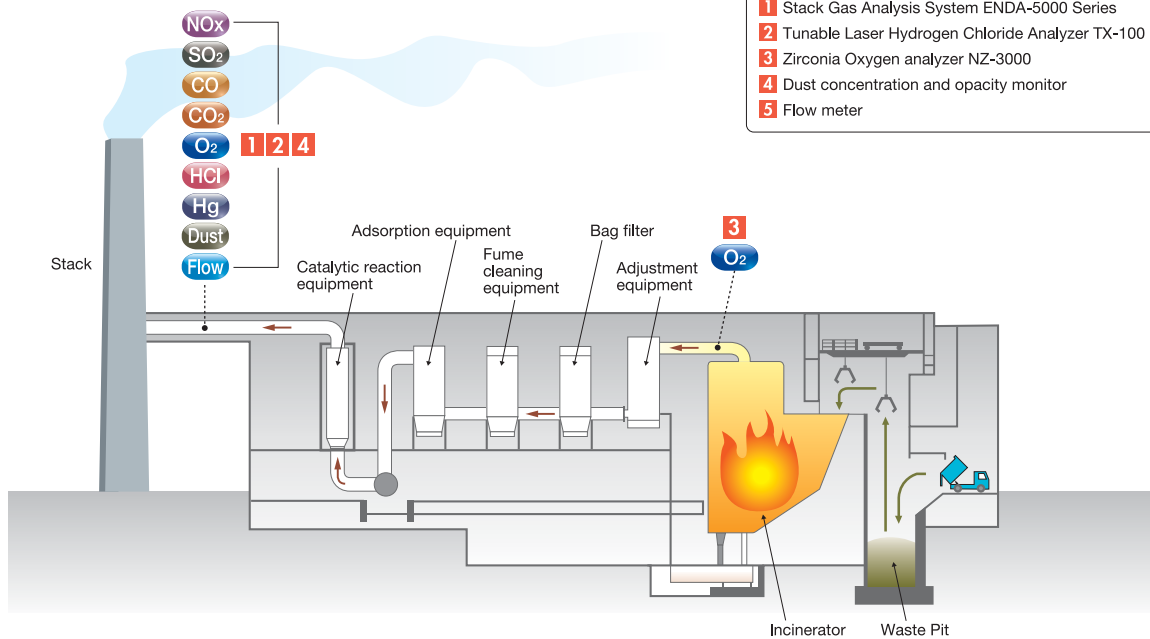
Stores devices in an environment optimal for analysis devices and data processing devices.

## Applications

### Power Generation - Exhaust Gas Monitoring System



### Waste Incineration Exhaust Gas Monitoring System



## HORIBA CEMS Capabilities

HORIBA's experience in designing, installing and starting up continuous emissions monitoring systems provides the customer with a monitoring solution that meets and exceeds their application's monitoring requirements.

### System Recommendations

- HORIBA recommends system configuration
- HORIBA integrates its products and others into systems to maximize performance

### System Installation Services

- HORIBA's field services include:
  - System installation
  - Auxiliary system component installation
  - System start-up

### Post System Maintenance

- HORIBA provides:
  - Periodic maintenance programs
  - Expedited delivery of consumable and spare parts

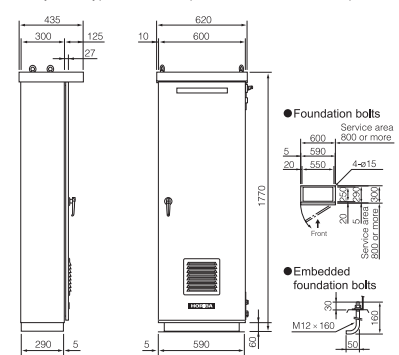
## Specifications

Model		ENDA-5000				
Component		NO <sub>x</sub>	SO <sub>2</sub>	CO <sup>#1</sup>	CO <sub>2</sub>	O <sub>2</sub> <sup>#2</sup>
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 <sub>2</sub> 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 <sub>2</sub> 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 + T90 from equipment intake area) (sample flow 0.6 L/min.) (within 240 seconds for SO <sub>2</sub> 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)				
	Humidity	90% or less (no condensation) <sup>#3</sup>				
	Vibration	100 Hz, 0.3 m/s <sup>2</sup> or less				
Measuring Gas Condition	Dust	Standard environment or better				
	Temperature	250°C or lower				
	Dust	0.1 g/Nm <sup>3</sup> or less				
Standard gas composition <sup>#4</sup>		NO: 500 ppm or less; NO <sub>2</sub> : 15 ppm or less; SO <sub>2</sub> : 1000 ppm or less; SO <sub>3</sub> : 50 ppm or less; CO: 200 ppm or less; CO <sub>2</sub> : 15 vol% or less; H <sub>2</sub> O: 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 <sub>2</sub> . When there is no measurement method authorization: N <sub>2</sub> or ambient air				
	O <sub>2</sub> carrier gas	Ambient air				
	Span gas	Gas cylinder for each component measured (when there is no measurement method authorization: O <sub>2</sub> 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) 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 contact with sample gas		SUS-316 stainless steel, SUS-304 stainless steel, PTFE, polypropylene, polyethylene, fluororubber, PVC, PVDF, and glass				
Enclosure		Independent outdoor installation 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				

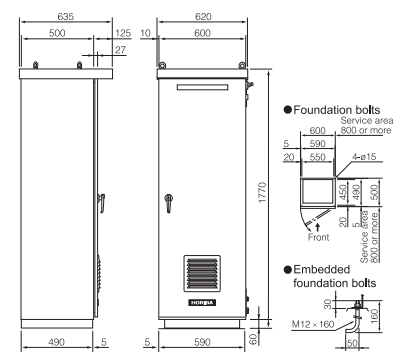
\*1: The analyzer against N<sub>2</sub>O interference for CO analyzer applies the standard range of 200 ppm or more (no optional range). \*2: No carrier gas cylinder is necessary. \*3: For the temperature range of -15°C to 40°C (cold district) and for the specification of -5°C to 50°C, we will separately discuss the design. \*4: When the coexisting gas contains NH<sub>3</sub>, NH<sub>3</sub> scrubber is prepared for an optional part. When CH<sub>4</sub> coexists in the sample gas for SO<sub>2</sub> analyzer, the SO<sub>2</sub> analyzer of CH<sub>4</sub> interference compensation type is prepared. When N<sub>2</sub>O coexists in the sample gas for CO analyzer, the CO analyzer of N<sub>2</sub>O interference compensation type is prepared.

## Dimensions (unit: mm)

{ 3-cylinder type }



{ 6-cylinder type }



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



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.



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