

## Flue Gas Analyzers (CEMS)

### UV-DOAS & TDLAS

Advance Technology

- The Approved Technology by TUV, MCERT & meets USEPA Calibration Protocols
- Remote Calibration Facility
- Low Maintenance
- No Moving Parts
- No Coolers
- Normalization as per Pollution Control Board requirements
- All Measurements in One Analyser

Rich Experience in Power Plants  
15 MW to 800 MW



Insitu CEMS Analyzers  
Model No.: UT-IN-Series



Extractive CEMS Analyzers  
Model No.: UT-EX-Series

### Environmental Technology

Continuous Emission Monitoring System	UV DOAS UV DOAS TDLAS TDLAS Laser (BW/FW) In-situ Pitot type	SO <sub>2</sub> NO <sub>x</sub> NH <sub>3</sub> , HCL, HF, H <sub>2</sub> S, CH <sub>4</sub> , H <sub>2</sub> O CO, O <sub>2</sub> or CO <sub>2</sub> as per CPCB Dust Flow, Pressure & Temp.
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Analysis | Monitoring | Performance





### Focusing Environmental and Industrial Analysis with Vision

- 20 years in the business
- An ISO 9001 company
- Promise to reduce at least one hour of maintenance engineer per day
- Designed products with reduction of maintenance time
- Young professionals
- Worldwide sales and services support in 40 countries
- Extensive network of branches and business partners worldwide
- International tie ups for state of the art products systems

Considering market demand and source and service parts issue SEPL invested in CEMS product development and started integration in India with State of Art technology in New SEZ Manufacturing Facility (60,000 Sq. Ft.) in Pune.





# Products by STEAM

**In-situ CEMS**



**Extractive type CEMS**



**In-situ laser gas analyzer**



**Opacity (PM) monitor**



**Flow temp. & pressure integrated monitor**



**Portable CEMS gas analyzer**



**AAQMS**



**EQMS**



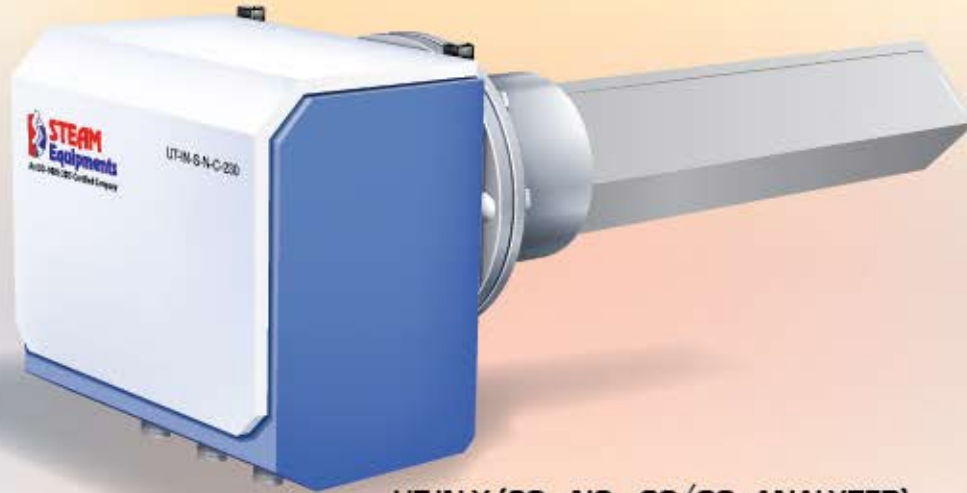
**Water/Ammonium Quality Analyzer**



**Cloud base CPCB & SPCB pollution control software**



# Flue gas analyzer (INSITU)



**UT-IN-X (SO<sub>2</sub>, NO<sub>x</sub>, CO/CO<sub>2</sub> ANALYZER)**

- Features principle of in-situ/ UV DOAS & TDLAS technology**
- No need sampling/ direct monitoring**
- Quick response time**
- Low maintenance costs**
- No interference of dust and humidity**
- Practicable of remote calibration**
- SO<sub>2</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>**
- Easy to carry**
- No coolers**
- No pump**
- All measurements in one analyzer**

List	Specification
Principle	UV-DOAS & TDLAS
Response Time	< 120 sec (T90)
Stack gas temp	< 300°C
Accuracy	≤ ± 2% FS
Repeatability	≤ ± 0.5% (UV-DOAS based SO <sub>2</sub> , NO <sub>x</sub> Analyzer) ≤ ± 1% (TDLAS based CO/CO <sub>2</sub> Analyzer)
Zero/Span drift	≤ ± 1% FS/7 day (UV-DOAS based SO <sub>2</sub> , NO <sub>x</sub> Analyzer), ≤ ± 1% FS /half year (TDLAS based CO/CO <sub>2</sub> Analyzer)
Maintenance interval	3 months, depends on field condition
Caliberation interval	1 month
Enclosure Class	IP55, IP65
Ambient temperature	-20°C to +60°C
Analog output	Each channel 4-20 mA
Digital Input	1-way RS232, 3-way RS485
Digital output	RS232, RS485
Relay output	6, output can be configurable, DC 30V, 2A
Power supply	220 ± 15% VAC, 5kW

## Measurement ranges

Parameters	Minimum Range	Maximum Range
SO <sub>2</sub>	0-500ppm	0-5000ppm
NO	0-500ppm	0-5000ppm
NO <sub>2</sub>	0-500ppm	0-5000ppm
NO <sub>x</sub>	0-500ppm	0-5000ppm
CO	0-50ppm	0-100% Vol.
CO <sub>2</sub>	0-1%	0-100% Vol.



## Laser gas analyzer (IN-SITU)



An ISO-9001:2015 Certified Company



In-Situ Laser gas analyzer UT-IN-series  
CO/CO<sub>2</sub>/NH<sub>3</sub>/HCL/HF/H<sub>2</sub>S/HCN/CH<sub>4</sub>/  
C<sub>2</sub>H<sub>2</sub>/C<sub>2</sub>H<sub>4</sub>/H<sub>2</sub>O/O<sub>2</sub>

### Features

- Principle of in-situ/  
TDLAS technology
- No need sampling /  
Direct monitoring
- Quick response time
- Low maintenance costs
- No interface of dust and  
humidity
- Practicable of remote  
calibration
- Easy to carry
- All measurements in one  
analyzer

### Specifications

Response time	< 120 sec (T90)
Gas temp	< 300°C
Accuracy	≤ ± 2% FS
Repeatability	≤ ± 1%
Span Drift/Zero Drift	≤ ± 1% FS/half year
Cal interval	< 2 times/year
Maintenance interval	< 2 times/year, Clean optical window
Enclosure Class	Safe Area/IP65/IP66
Ambient temperature	-20° to +60°
Analogue output	4-20 mA for each measurement
Relay output	6, output can be configurable, DC 30V, 2A
Digital input	1-way RS232, 3 - RS485
Digital out put	RS232, RS485
Power supply	230VAC/110VAC

### Measurement ranges

Parameters	Minimum Range	Maximum Range
CO	0 -50ppm	0 -100% Vol.
O <sub>2</sub>	0 -1%	0-40%
H <sub>2</sub> S	0 -100ppm	0 -1000ppm
HF	0 -10ppm	0 -100ppm
CH <sub>4</sub>	0 - 40 ppm	0 - 100% Vol.
C <sub>2</sub> H <sub>2</sub>	0 -10 ppm	0 -100% Vol.
C <sub>4</sub> H <sub>4</sub>	0 - 60 ppm	0 - 100% Vol.
CO <sub>2</sub>	0-1%	0 - 100%
H <sub>2</sub> O	0 - 200 ppm	0 - 40% Vol.
NH <sub>3</sub>	0 -10 ppm	0 - 500 ppm
HCL	0 - 50ppm	0 - 500 ppm
HCN	0 -30 ppm	0 -1 % Vol.



# Extractive Type Continuous Emission Monitoring System (CEMS)

## Flow Principal

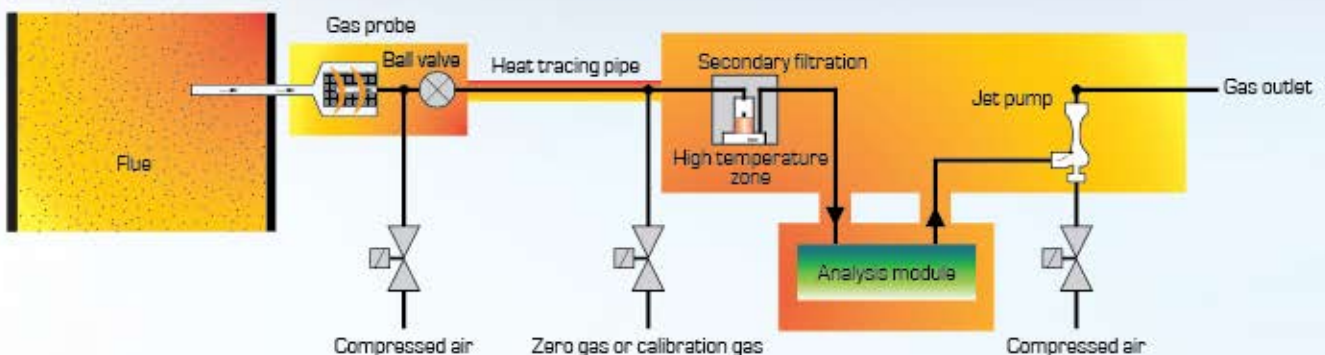
Under the work of high temperature sampling pump, the gas passes through sampling probe (filter cartridge included) ball valve heating tracer, secondary filtration and then enters into UV analysis module and finally be drained. By adopting 150°C high temperature heat tracing for whole process, it can effectively prevent SO<sub>2</sub>, HCL and other detected gases from being dissolved and loss for condensed water. By controlling Back blow valve impulse, the system can regularly back- blow filter cartridge of sampling probe and close the ball valve the

prevents high level dust from blocking the filter cartridge. The analyzer support Auto / Manual calibration (Zero and Span calibration) ; the measuring flow path need to be closed when the calibration is working.

Pressure transmitter can be used to compensate measuring value and also check if probe is block.

Secondary filtration is adopted to protect UV analysis module to ensure it will not be polluted by flue gas and dust when probe is leakage or temperature control is invalid.

## Gas Path



## Structural composition

Continuous Emission Monitoring system (CEMS) consists of particulate matter monitoring subsystem, gaseous pollutants monitoring subsystem, flue gas parameters monitoring subsystem, system control and data acquisition and processing subsystem. It can monitor gases such as SO<sub>2</sub>, NO<sub>x</sub>, O<sub>2</sub>, Dust, temperature, pressure, flow rate, humidity etc. It can also be extended for a specific occasion to monitor HCL, HF, CO, CO<sub>2</sub>, NH<sub>3</sub>, H<sub>2</sub>S, Cl<sub>2</sub>, VOC and other parameters. The measured gas passes through sampling probe for De-dusting, heating tube for sampling, then goes into the gas analysis module (Violet



differential optical absorption - spectroscopy (DOAS) For analysis measurements. It effectively solves the technical problems of dust and moisture interference on measurement, particularly in the case of low concentration measurements with an unparalleled advantage.





**UT-EX-X (NO<sub>x</sub>, SO<sub>2</sub>, O<sub>2</sub>, CO, CO<sub>2</sub>, HCL, H<sub>2</sub>O, HF, NH<sub>3</sub>, H<sub>2</sub>S ANALYZER)**

**Features**

UV-DOAS, TDLAS

Principle

Composition with gas sampler and gas conditioner

Quick response time

Especially for stack

Assembled in 19" rack mount

High measurement

Accuracy

High reliability

Wide application scope

List	Specification
Principle	UV-DOAS & TDLAS
Response Time	< 40 sec (T90)
Stack gas temp	300°C (Higher temp. request to be customized)
Accuracy	≤ ± 2% FS
Repeatability	≤ ± 0.5% (UV-DOAS based SO <sub>2</sub> , NO <sub>x</sub> Analyzer) ≤ ± 1% (TDLAS based CO/CO <sub>2</sub> Analyzer)
Zero/Span drift	≤ ± 1% FS/7 day (UV-DOAS based SO <sub>2</sub> , NO <sub>x</sub> Analyzer), ≤ ± 1% FS /half year (TDLAS based CO/CO <sub>2</sub> Analyzer)
Maintenance interval	2-3 months, depends on field condition
Calibration interval	1 month
Sample gas flow	1.5 ± 0.5 L/min.
Sample gas pressure	The current environment pressure ± 0.1 bar
Heat tracing temp.	50°C to 200°C
Ambient temp.	-10°C to +50°C
Analog output	Each channel 4-20 mA, maximum load capacity < 800 Ω
Digital output	14, configurable
Relay output	14 output, configurable, DC, 30V, 2A
Power supply	220 ± 15% VAC, 300 W
Relay input	6, configurable
Communication function	RS232/RS485

**Measurement ranges**

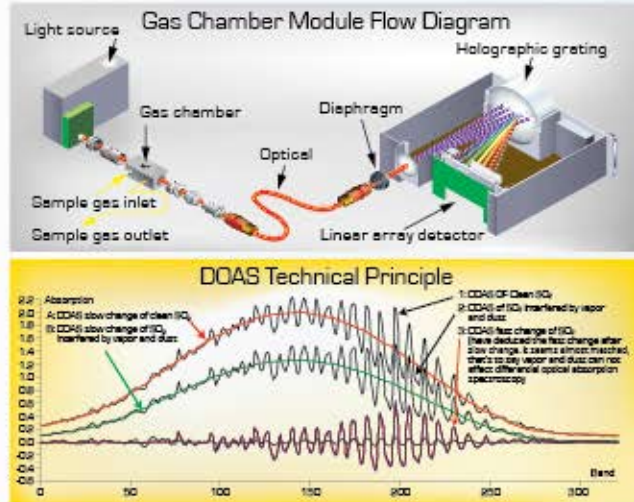
Parameters	Minimum Range	Maximum Range
CO	0 -50ppm	0 -100% Vol.
O <sub>2</sub>	0 -1%	0-40%
H <sub>2</sub> S	0 -100ppm	0 -1000ppm
HF	0 -10ppm	0 -100ppm
CH <sub>4</sub>	0 - 40 ppm	0 - 100% Vol.
C <sub>2</sub> H <sub>2</sub>	0 -10 ppm	0 -100% Vol.

Parameters	Minimum Range	Maximum Range
C <sub>4</sub> H <sub>4</sub>	0 - 60 ppm	0 - 100% Vol.
CO <sub>2</sub>	0-1%	0 - 100%
H <sub>2</sub> O	0 - 200 ppm	0 - 40% Vol.
NH <sub>3</sub>	0 -10 ppm	0 - 500 ppm
HCL	0 - 50ppm	0 - 500 ppm
HCN	0 -30 ppm	0 -1 % Vol.



# UV differential optical Absorption spectroscopy (DOAS) (UV-DOAS)

## Product overview



Based on DOAS and chemometric algorithms (PLS), this analyzer can measure SO<sub>2</sub>, NO, NO<sub>2</sub>, O<sub>2</sub>, NH<sub>3</sub>, CL<sub>2</sub>, O<sub>3</sub>, H<sub>2</sub>S and etc. With high accuracy and reliability, fast response time, wide self-developed and industrial measurement range and application fields, it has achieved even surpassed similar products at home and abroad. It can be widely used in environmental online monitoring, industrial process control, safety monitoring, etc.

Technical Principle of UV DOAS : UT-EX flue gas analyzer applies UV DOAS Technology. The optical technology platform consists of light sources, gas chamber, optical and spectroscopic (including diaphragm, holographic grating, linear array detector) and other optical components, refer to fig1, fig 2, fig 3 ultraviolet light is sent by the light source through the optical window into gas chamber; absorbed by the sample gas through the gas chamber. The light carrying sample absorption information gathers through lens coupled into fiber and then transmits through the optical fiber into spectrometer. After light splitting and photo-voltaic conversion, absorption spectrum is obtained and analyzed to calculate the concentration of the related components in gas.

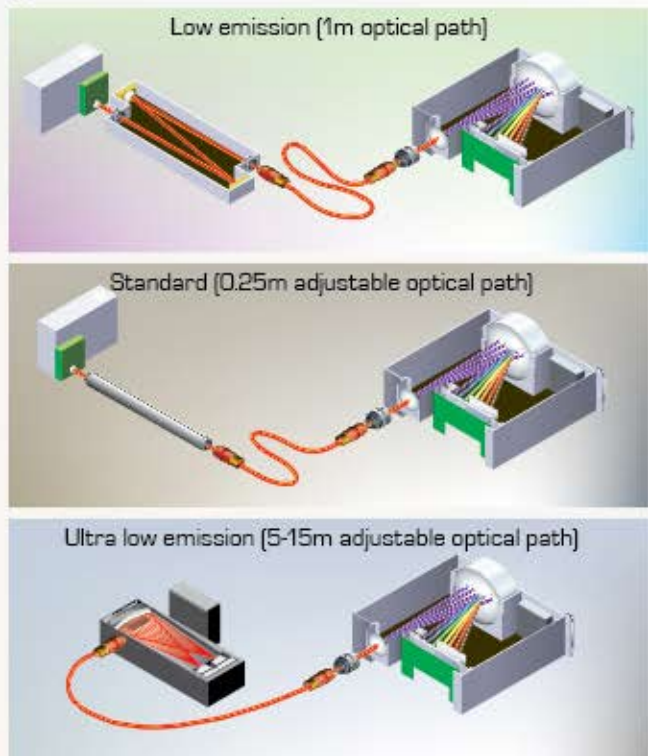
Note: The differences of UT-EX Standard analyzer, low emission analyzer and ultra-low analyzer are the different gas chamber the optical length inside it : for standard analyzer, it adopts dual lens collimation system with 0.25m optical path ; for low emission analyzer, it adopts many times return gas chamber with 1m optical path ; for ultra-low emission analyzer, it uses white cell gas chamber with adjustable optical path of 5- 15m.

## About technology (UL-DOAS)

The analyzer adopts UV differential optical absorption spectroscopy (DOAS) which can precisely measure concentrations of trace gases using absorption spectrum by gas component. The basic principle is to identify gas molecule with the narrow-band of detected molecule. And inverse the concentrations of molecules from the absorption intensity of narrow-band. The absorption cross section is regarded as the super position of two parts one part slowly changes with wavelength and form the broad -band of optical spectrum, the other part rapidly changes with wave length and form the narrow-band of optical spectrum formula is as follows :

$$\sigma_i(\lambda) = \sigma_{io}(\lambda) + \sigma_{ir}(\lambda)$$

$\sigma_i(\lambda)$  represents molecules absorption cross-section;  $\sigma_{io}(\lambda)$  represents the part which slowly changes with wavelength;  $\sigma_{ir}(\lambda)$  represents the part which rapidly changes with wavelength. The theory of DOAS is to eliminate slowly changing part and only keep fast changing part in the absorption spectrum, and inverse the concentrations of trace gases from the fast changing part, it can avoid fluctuation and drift of measured value for temperature or damping of light source, interference by dust or other gases and other sectors.

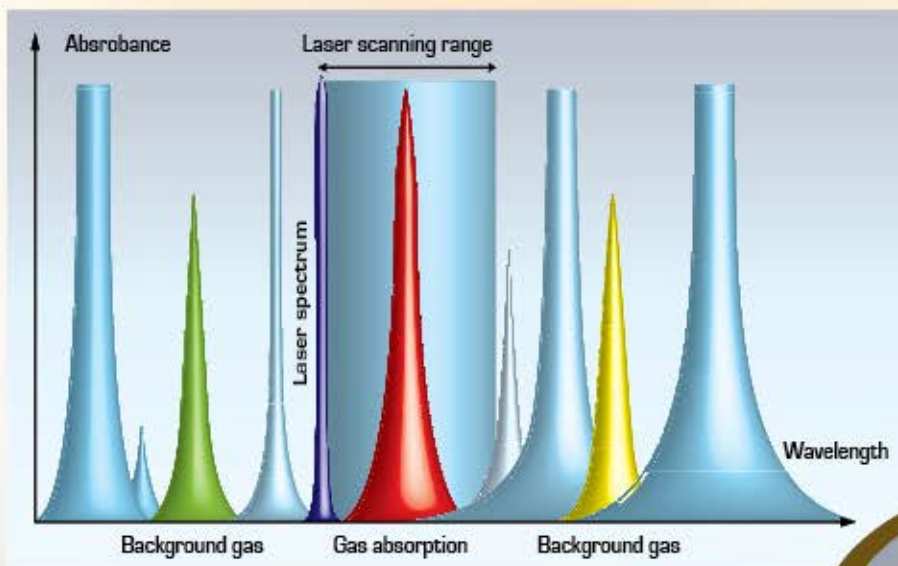




TDLAS (Tunable Diode Laser Absorption Spectroscopy) mainly uses the character that tunable laser's narrow band and wavelength change with the current. By periodically modulating the current, the laser wavelength can be periodically changed within a small range, and the "single-line absorption spectrum" data of the measured gas can be obtained in each cycle. At present, the TDLAS technology has developed into a kind of high sensitivity, high resolution, fast response and high selectivity of gas detection

technology, widely used in the molecular spectroscopy, industrial process monitoring control and diagnosis analysis, the engine combustion process efficiency and motor vehicle exhaust measuring trace, explosive detection the atmosphere pollution monitoring, etc.

By using a tunable semiconductor laser. Laser gas analyzer scans the specific absorption lines of the measured gas (no background gas) to get the second harmonic of the gas. Through processing and analyzing the second harmonic and the broadening information of the gas, the concentration of the gas is obtained.



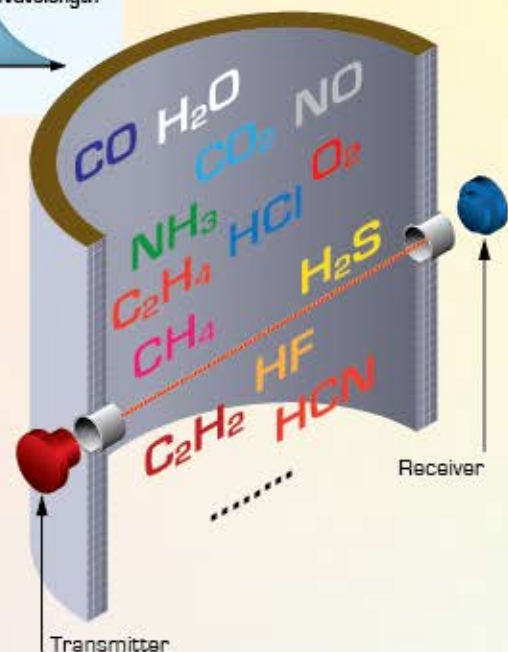
### TDLAS Characteristics

#### High selectivity

TDLAS is high resolution spectrum technology. Due to the "Fingerprint" characteristics of the molecular spectrum. It is not affected by the interference of other gases. This feature has obvious advantages compared with other methods.

#### High versatility

TDLAS is an effective general technology to All activist with infrared absorption. Only need to change laser and standard gas. The same instruments can be convenient to measure the other components. Based on this characteristic, it can be easily changed to multi-component measurement instruments.



#### High sensitivity

TDLAS has advantages of rapid response speed and high sensitivity. In the case of not losing sensitivity, its time resolution can be found in ms level.



# IM - TPF 100 [Temp, Pressure & Flow]



## Overview

IM-TPF 100 temperature pressure & flow rate integrated monitoring is a new generation of Online monitoring instrument, which can monitor the temperature, pressure and flow rate of flue gas in the pipeline in a long time under severe conditions. It is an important parameter to calculate the pollutant emission in the continuous monitoring system (CEMS). IM-TPF 100 has high precision micro differential pressure/static pressure sensor with equipped blow back unit. Compared with conventional integrated monitor, it can measure pressure value. Minimum to 1m/s automatic timing or manual calibration for Pressure and velocity. LED display measure data and signal convenient reading and debugging; smaller size, convenient for moving installation and maintenance.

## Features

- 2m/s low flow rate measurement by pressure sensor of ultra - low range**
- Operation unit with LCD screen: Perfect HMI provided**
- Settable parameters: timing purge, velocity field, pitot coefficient and etc.**
- Protection for over pressure to avoid damage to pressure sensor and low operation cost**
- Automatic zero calibration, the output signal strong**
- Pitot anti-blocking, anti-corrosive**
- Better precision, smaller volume, pipeline design is more simple**
- Measure the air pressure value**

## Principle

Temperature, pressure & amp; Flow rate integrated monitor is based on the principle of pitot differential pressure. When measure, insert the pitot probe into the pipe. Total pressure hole face to the flow, static pressure hole back to flow. The total pressure and static pressure are transferred to the pressure transmitter, and the flow rate is calculated according to the formula. When taking differential pressure, differential pressure transmitter needs to measure total pressure and static pressure. So special attention should be paid to pilot direction during installation, make sure the direction of two pressure taking ports is the same as flow direction of flue gas : total pressure taking port is directed to coming direction of flue gas and static pressure taking port is directed to leaving direction of flue gas. There are two installation methods, Vertical installation and Horizontal Installation, as following figure.

## Specifications

[Temp., Pressure and Flow rate Integrated Monitor]

Principal	Pitot
Pitot material	316, 316L SS
Accuracy	≤ ± 5 % FS
Output Signal	3* 4 - 20 ma, 1*232/485
Purge Pressure	0.3 Mpa ~ 0.8 Mpa
Storage temp.	0 to 50 °C
Pressure limit of differential pressure transmitter	1.0 Mpa
Range of Pressure Transmitter	-5kPa ~ 5kPa, -10kPa ~ 10 Pa
Pitot insert length	400 ~ 1700 mm (optional)
Range of temp. Transmitter	0 °C ~ 300 °C (Customizable)
Temp. Range of flue gas	- 40 °C ~ 300 °C (Customizable)
Range of Flow	0 - 40 m/s/0-15.5 m/s (Optional)
Ambient Temp.	- 40 °C ~ 70 °C
Storage Humidity	0 ~ 85% RH
Power Supply	110 VAC/230 VAC



## Overview



**BS -100**

Online dust monitoring device using the mainstream technology of laser back-scattered light principle with imported core components. BS-100 is mainly used for continuous monitoring of various sources emissions of particulate matter concentrations. It can be either equipped with CEMS, or connected with dust monitoring network by a shared set of data acquisition and processing background.

It is available for the monitoring and control of soot emission, flue gas  $DeSO_x$  and removal of dust for power generation boilers, industrial furnaces, industrial boilers in the thermal power, iron and steel metallurgy, petrochemical, chemical cement production, ceramics, waste incineration, etc.

## Features

**In-situ zeroing and span calibration**

**Automatic gain control function and temperature compensation**

**Smart appearance, easy installation, convenient disassembly**

**Without background light influence**

**Infrared remote control**

## Measuring Principle

Series of BS dust monitors consist of optical parts, circuit and control sections, calibrator and purge system.

The laser beam (650 nm) comes across the detection area and produces scattered light after effect with dust particles. The back-scattered light crosses the lens coverages into photosensitive detector. Analyzer circuit and control section converts light signal into signal output which is proportional to the dust concentration, and obtains dust particles emission concentration of pollution.

## Specifications

Principle	Backward scattering
Ranges	0 ~ 200mg/m <sup>3</sup> , 0 ~ 10g/m <sup>3</sup> (option)
Accuracy	± 2% F.S.
Repeatability	± 1% F.S.
Response Time	1s
Laser Transmitter	650nm
Flue Gas Temperature	< 500°C (higher temperature need to be customized)
Ambient Temperature	- 40 to + 50°C
Duct Diameter	> 0.7m
Analog Output	4-20mA maximum load 800Ω, 2 x (4-20) mA
Digital Interface	RS485, 2 relay outputs
HMI	IRC+LCD
Weight	2Kg
Power	< 3W
Supply	24VDC/110VAC/230VAC
Enclosure class	IP 65



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Greece	Hungary	Italy	Spain	Brazil
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Sudan	Uganda	South Africa	Nigeria	Australia
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**STEAM Equipments**  
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