

# Flue Gas Analyzer

## EM-5



Focusing on  
Environmental & Industrial Analysis

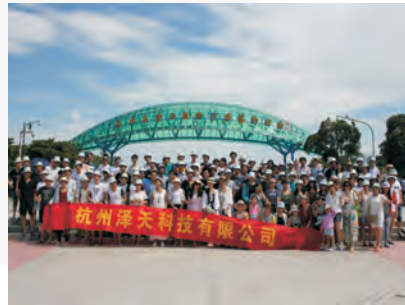
## ■ Company Profile

Hangzhou Zetian Technology Co., Ltd. is located in high-tech development zone of Binjiang District, Hangzhou, China. There are more than 10000 square meters for official business and manufacture. Zetian is a professional manufacturer specialized in R & D, producing and selling online monitoring instruments for environmental monitoring, industrial process control and industrial safety.

Zetian strictly follows the standard of ISO9001 quality system to develop and produce, and also increase both its production quality and service quality by bringing in ERP management system and TQC comprehensive quality management. Since establishment, Zetian Tech. has rapidly developed and improved with the efforts by all staff. Now all products have been integrated with technologies from various fields, including optics, microelectronics, telecommunication, software, electrical and mechanical engineering, analytic chemistry and etc. Zetian is among the few innovative companies in the world who has its own intellectual properties on gas analysis devices, water analysis instruments and dust monitoring products at the same time.

The instruments and analyzers produced by Zetian now are widely used at home and abroad. They are: UV DOAS gas analyzer, laser TDLAS gas analyzer, gas analysis module, forward/backward laser dust monitoring devices, hygroscope for high temperature, continuous emission monitoring system (CEMS), denitration escape ammonia analyzer, sulphur analyzer, trace Cl analyzer system, immersive UV broad spectrum water analyzer, ammonia nitrogen analyzer, colorimetric heavy analyzer, anodic stripping voltammetry heavy metal analyzer etc.

After years of developing, Zetian has cooperated with and attracted many worldwide clients of online monitoring and process control, including system integrator, agents, operation and maintenance providers, equipment manufacturers, thermal power plants, sewage treatment plants, chemical plants and the like. What we can offer are high cost-effective intellectual monitoring instrumentation and analysis equipment, analysis module /component, CEMS program sets, complete set of water quality analysis program and other similar products. OEM and ODM are acceptable for us, and we can also provide operation, maintenance and other services.



## ■ Product Overview

EM-5 series flue gas analyzers are independently developed by Hangzhou Zetian Technology Co., Ltd., for domestic and overseas environmental and industrial control site monitoring online analysis. Based on DOAS and chemometric algorithms (PLS), this analyzer can measure  $\text{SO}_2$ ,  $\text{NO}$ ,  $\text{NO}_2$ ,  $\text{O}_2$ ,  $\text{NH}_3$ ,  $\text{Cl}_2$ ,  $\text{O}_3$ ,  $\text{H}_2\text{S}$ ,  $\text{CH}_3\text{I}$  and etc. With high accuracy and reliability, fast response time, wide 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.

Based on years of experience in research and development, combined with thousands of successful application cases, Various types of analyzer (standard type, low emission type, ultra-low emission type, custom type, etc.) are derived to meet the requirements of the analyzer in different working conditions.

## ■ Technical Principle

EM-5 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 fig.1, 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 spectrograph. The absorption spectra of gas are obtained by means of spectrophotometry and photoelectric conversion.

The concentration of relative components in the gas can be calculated, by analyzing the spectrum.

Note: the differences of EM-5 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.

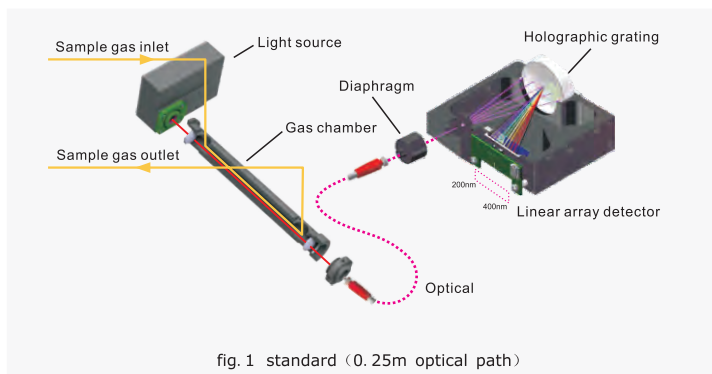


fig. 1 standard (0.25m optical path)

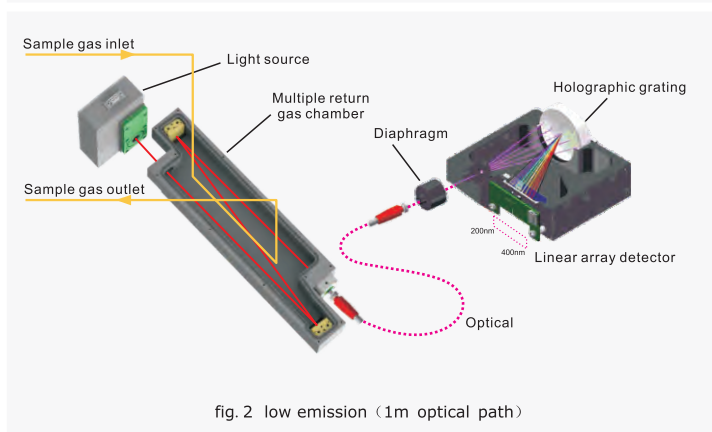


fig. 2 low emission (1m optical path)

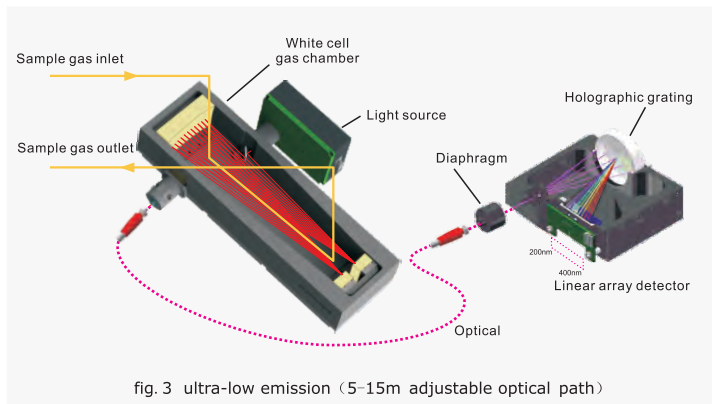


fig. 3 ultra-low emission (5-15m adjustable optical path)

## Technical Features

### High measurement accuracy

- The minimum detection limit of SO<sub>2</sub>, NO, NO<sub>2</sub> can be 1mg/m<sup>3</sup> (15m optical path).
- Ultraviolet has no moisture absorption, undisturbed by moisture and dust.
- No cross interference between the gas being measured (see table 1).
- NO and NO<sub>2</sub> can be measured at the same time, dispense with converter.
- Low detection limit.

### High reliability

- Small amount of zero drift and span drift.
- Modular design.
- No optical moving parts and no vibration influence.
- Strong gas cell, low cost.
- Spectrum automatic adjustment technology, long free maintenance cycle.
- Light source adopts the pulse source, the service life is 10 years.

Table1: Gas Cross Interference Table

Measuring gas	SO <sub>2</sub>	NO	NO <sub>2</sub>	O <sub>2</sub>
Interfering gas				
SO <sub>2</sub> (500ppm)	\	<1ppm	no	no
NO (500ppm)	no	\	no	no
NO <sub>2</sub> (500ppm)	no	<1ppm	\	no
H <sub>2</sub> O (No dew)	no	no	no	no
CO (1000ppm)	no	no	no	no
CO <sub>2</sub> (20%)	no	no	no	no
O <sub>2</sub> (21%)	no	no	no	\

### Wide application scope




- Chloralkali plant PVC process
- Titanium white production process
- Sulfur recovery process
- Natural gas purification process
- Methyl iodide analysis for the coal chemical industry.
- On-line air monitoring
- Coal-fired power plants
- Cement plant
- Industrial furnaces
- The desulfurization process monitoring
- Denitration process monitoring
- Incinerators

## Technology Comparison

NDIR Technology	FTIR Technology	UVF + Chemiluminescence Technology	Adopted Technology
Low cost	High cost	High cost	Low cost
Measure fewer components, generally, the single gas chamber can only measure one kind of gas	Measure over 10 components, which is the greatest advantage	Measure fewer components, different components use different measuring principle	The single gas chamber can measure 3-5 components
Have the optical moving parts, with low reliability	The interferometer is an optical moving part	No optical moving parts	Adopt the full spectrum electronic scanning and have no optical moving parts
Single or dual wavelength	Full infrared spectrum measurement	Sensitive to some interference, such as the background fluorescence and quenching effect, etc.	Full ultraviolet spectrum measurement, and no effect by the cross interference
Fast response, long preheating time	Restricted by the scanning time, slow response, need preheating	Fast response, poor stability and reproducibility caused by high light background	Fast response, short preheating time
Low measurement accuracy and large drift	High measurement accuracy and small drift	High measurement accuracy and large drift	High measurement accuracy and small drift
High requirements for the measured gas, no dust and low dew point	High requirements for the measured gas, no dust and low dew point	High requirements for the measured gas, no dust and low dew point	Water and a small amount of dust will not affect the measurement
Adopt the continuous light source, with the service life of thousands of hours	Adopt the continuous light source, with the service life of thousands of hours	Adopt the continuous light source, with the service life of thousands of hours	Adopt the pulse source, with the service life of ten years
High detection limit	Low detection limit	Low detection limit	Low detection limit, the minimum reaches 1mg/m <sup>3</sup>



## Technical Specifications

		Standard		Low Emission		Ultra-low Emission	
Appearance							
Model		EM-5-S		EM-5-L		EM-5-UL	
Measurement Principle		DOAS+PLS					
Typical detecting gases		Min.	Max.	Min.	Max.	Min.	Max.
Detection range	SO <sub>2</sub>	0 ~ 300ppm	0 ~ 3000ppm	0 ~ 100ppm	0 ~ 300ppm	0 ~ 20ppm	0 ~ 100ppm
	NO	0 ~ 300ppm	0 ~ 3000ppm	0 ~ 100ppm	0 ~ 300ppm	0 ~ 20ppm	0 ~ 100ppm
	NO <sub>2</sub>	0 ~ 1500ppm	0 ~ 15000ppm	0 ~ 500ppm	0 ~ 1500ppm	0 ~ 20ppm	0 ~ 500ppm
	O <sub>2</sub>	0 ~ 5%	0 ~ 25%	0 ~ 5%	0 ~ 25%	0 ~ 5%	0 ~ 25%
Linearity		≤ ± 1.5%F.S.					
Repeatability		0.5%					
Zero Drift		≤ ± 2%F.S./7d					
Span Drift		≤ ± 2%F.S./7d					
Response Time(T90)		< 10s		< 30s		< 30s	
Working Temperature		- 20℃ ~ + 50℃					
Preheating Time		No preheating		Approx. 10 min			
Sample Gas Interface		Φ6 Bi-Lok					
Sample Gas Flow		( 0.5 ~ 2 ) L/min, Fluctuation <25%					
Sample Gas Pressure		The current environmental pressures ±0.1Bar					
Sample Temperature		0℃ ~ + 50℃					
Sample Gas Humidity		No condensation (under sample temperature)					
4-20mA Input Interface		3 , configurable, 100Ω load					
4-20mA Output Interface		5 , output can be configured, maximum load capacity ≤800 Ω					
Switch Input Interface		6 , configurable					
Relay Output Interface		14 , output can be configured. DC 30V2A					
Communication Interface		1×RS232, 1×RS485 (Support the Modbus protocol)					
Installation		Installed in 19 inch cabinet					
Supply		220VAC ± 10%					
Power		About 100W		About 200W			
Outline Dimension		132(H)x483(W)x378(D)mm		177(H)x483(W)x412(D)mm		177(H)x483(W)x434(D)mm	
Weight		About 10kg		About 12kg			

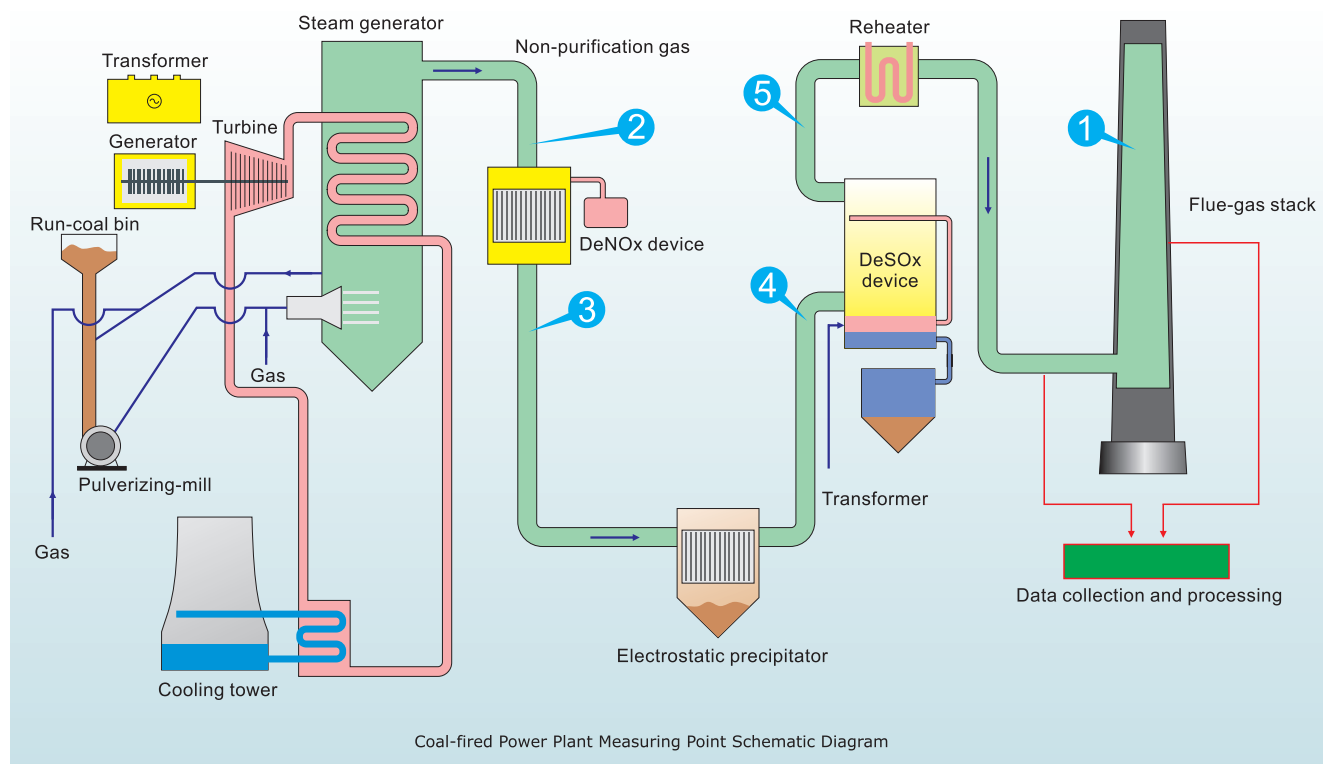
# Products Size Comparison

## External Dimension

	Standard Form	Low Emission	Ultra-low Emission
Front			
Back			
Top			
Side			
Inside			

## Typical Application

Coal-fired power plant is the major emission source of flue gas, SO<sub>2</sub>, NO<sub>x</sub> and other pollutants which strongly influence environment. Gas component monitoring is the main method to control industrial process and tail gas emission to optimize industrial technology and achieve ultra low emission.



Measuring Point	Detection Point	Temperature	Pressure	Measuring Component	Monitoring Purpose	Recommended Products *
Point 1	Main Emission Flue-gas stack	Normal	micro-positive pressure	CEMS (5 parameters )	Online monitoring emission of each component in tail gas	EM-5
Point 2	Before DeNO <sub>x</sub>	Normal	micro-positive pressure	NO <sub>x</sub> , O <sub>2</sub>	Real-time monitoring the efficiency of DeNO <sub>x</sub> devices	EM-5
Point 3	After DeNO <sub>x</sub>	Normal	micro-positive pressure	NO <sub>x</sub> , O <sub>2</sub> , NH <sub>3</sub>	Real-time monitoring the efficiency of DeNO <sub>x</sub> devices	EM-5, LGT-100 or GA-5000
Point 4	Before DeSO <sub>x</sub>	Normal	micro-negative pressure	SO <sub>2</sub> , O <sub>2</sub>	Real-time monitoring the efficiency of DeSO <sub>x</sub> devices	EM-5
Point 5	After DeSO <sub>x</sub>	Normal	micro-positive pressure	SO <sub>2</sub> , O <sub>2</sub>	Real-time monitoring the efficiency of DeSO <sub>x</sub> devices	EM-5

\*Detailed reference manual and product samples.

*Look forward to working with you*



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