



## T-LGA4810WMS Series Laser Spectrometer

# Process Gas Analyzer

Ref: T\_LGA4810\_IntE

Revision:2004-09-1

Date: 2006-10-22

### \_\_\_\_\_for Continuously Analysis in Industry Process

- Rugged industrial design, real time measurement
- Continuously in situ monitoring, No gas sampling
- High selectivity by spectroscope optimization, free from interference of other gases
- High accuracy, non online calibration needed
- Adjustable measuring range
- Selectable output signals
- Easy installation
- Built-in calibration routines
- Dust on optical windows has less influence
- TAR type supports 1 to 3 gases analysis.
- Series structure suit to varies device and arts
- Enhancement modules support the system from single beam photometer to spectroscopy analyzer. for higher chemical selection or multi-gases analysis



## Measuring Principle

The LGA4810-Monitor is based on double beam double wave measuring principle photometer, Usually uses one beam.

One single default gas absorption line without interference is chosen in the near infrared spectral range. A single mode diode laser operating around room temperature scans this single absorption line. A detector detects the light and the absorption caused only by the gas molecules. Once the absorption by default gas molecules is detected, the gas concentration is calculated. Automatic corrections for temperature and pressure variations are included(need extra Pressure sensor, or order separately ).

## Applications

- Process control and Emission monitoring in flue
- Combustion and Emission control for incinerators
- Industry chemical process
- Research and Process optimization
- Open space gas detect fro stack

## Limitations:

- Only applicable for clean gases, with suspended particles less than 10mg/M3;
- Or could be purged with clean air or other gases available.

## Maintenance and Calibration

The rugged industrial design and the air purging make the Laser Gas Analyzer easy to maintain. There are no moving parts in the instrument and no consumables are needed during operation of the instrument. All critical parameters are monitored continuously and warning messages are given if maintenance is required beyond the recommended maintenance intervals. Calibration may be performed against certified calibration gas in the integrated internal cell, or on a separate calibration cell using certified calibration gas purged through the cell or contained in a sealed glass cell. The routine maintenance interval is three of months.

Call: (86)10- 8264.0226; 6257.3897;8911.1814; Fax: (86)10-8264.0221; 6252.3517;  
web: <http://www.fullsense.com.cn/> <http://www.bigdipper-technochem.com>

## Installation and Operation

The LGA4810 Monitor is easy to install and operate.

The transducer T model is one unit integrity; inserting the sensor part into gas container or pipe where suitable, and fixing the instrument with attached flange.

The AR model consists of 3 basic units: Transmitter unit, receiver unit and electronics unit.

The transmitter and receiver units are mounted directly to the process device by DN50/F165 flanges.

There are no moving parts in the instrument, thus preventative maintenance is limited to visual inspection and cleaning of optical windows.

Purging prevents dust from collecting on the optical windows. Experience shows that a three months preventative maintenance interval is sufficient for most applications.

## Calibration

The calibration procedure is easy. The monitor may be calibrated using the integrated flow through cell, or alternatively mounted to a separate calibration tube.

## Specifications

Optical path length (OPL): 0.5-6M, Max: <30 meter

Bandwidth: <10nm;

Start up time: <3 mins

Response time: Less than 2 seconds

Averaging time: Rolling average from 2 seconds to 24 hours (exp. decay)

Detection limit: Refer to Table 1

Min. measuring range: Refer to Table 1.

Max range: Refer to Table 1.

Dynamic range: 100 to 10000 :1

Instrument span drift: < 4% of measuring range between maintenance intervals

Instrument zero drift: Negligible (<2% of measuring range between maintenance intervals)

Maintenance interval: Recommended every 3 months (no consumables needed)

Calibration: Not needed in general running. In situ with flow through cell, or in separate calibration tube

## Input/ Output Signals

Analogue output: 0/4 - 20 mA current loop, 500 & max.

Digital output: RS 232 or RS485 by protocol of Modbus or STIMcom

Relay output: High gas relay (normally closed-circuit relays)

Warning relay (normally closed-circuit relays)

Fault relay (normally closed-circuit relays)

Analogue input: Optional 0/4 - 20 mA

## Operating Conditions

Ambient temperature: -20C to +55C

Maximum Sample Pressure: <1Mpa or 10 bars abs for general model. High pressure system under requirement;

Maximum Sample Temperature:

T type: Max <200°C;

TAR type: Max<500°C(direct set with cooling air). Extended to 1500°C possible with special installation.

Protection classification: Transmitter and Receiver units: IP65, optionally Ex-p adapted

Electronics unit: IP55, optionally IP65

Mains voltage: 24V DC

Power consumption: Less than 50 Watts (not include consumption of valve and air resource device)

## Mounting

Standard mounting: DN50/PN10, F165

Alignment tolerances: Flanges parallel within 1° with <1m light path(AR Model only).

Purging of air: Dry and oil-free pressured air or gas, or by fan. The pressure of purging air must be 0.1 kgf/cm<sup>2</sup> higher than that of samples in pipe.

Cooling air: adjust the flow to assure the temperature inside sensor is lower than 70 °C, this temperature could be read by instruments. In the case of high temperature application, cooling air must be guaranteed to supply continuously, once stop longer than seconds might damage the sensor. It was recommended to select AR model for high temperature application if possible.

Air connect::  $\phi$ 2- 6 pipe with M10 screw.

## Dimension and Weight

TR: Dia.150x (1000/possible sensor length+500/Electronics); 15Kg

Insertion Depth: <1300cm( varying from range)

Diameter of insertion part:  $\phi$ 50mm

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### TR/TAR:

Transmitter unit: Dia: 150x350 mm, 8 kg  
Receiver unit: Dia.150x350 mm] 8 kg  
Electronics unit: Dia. 120 x 400 mm, 5 kg

### Ordering Code:

TR/TAR-L[sample phase]A4810-[Product ID]-[gas]-R(range)-T[sample temperature]-P[sample pressure]-M[c-s-w]-S[serial port]P[communication portocol]-A[analog output standard]

### Coding information:

**Sample phase:** L for liquid sample, G for gases;

**Product ID:** Refer to Table 1.

**Connect code:** 0= none; 1=threat; 2=clamp; 3=Flange;

**Code Format of Contact Materials: xyz**

C: structure materials;

W: optical window;

S: seal ring

**Wet material code:** 01=PVC; 02=Nylon; 04=PTFE; 05=Acrylonitrile butadiene rubber; 06=Fluorinated rubber; 10=Iron; 11=AM alloy; 12=SS316; 13= Hastelloy – C; 30=Optical glass; 31:Quartz

### BigDipper Technochem Institute

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Table 1 Specifications of TR-4810WMS Transducer for single gas detector.

Gas		LDL/1M	Min/Typical range	Pressure	Temp.	Cross Interference Information	Application
VOCs	WMS01	CH4:0.05ppm C2H6:0.12ppm C3H8:0.3ppm C4H10: 0.3ppm	0-500 ppm	10atm	400℃	Most hydrocarbons, more sensitive to some inorganic	
VOCs	WMS01	CH4:0.02ppm C2H6:0.1ppm C3H8:0.09ppm C4H10: 0.08ppm	0-200 ppm	10atm	400℃	Most hydrocarbons, more sensitive to some inorganic	
VOCs	PM	5ppm(CH4)	0-500 ppm	10atm	400℃	Most hydrocarbons, less sensitive to most inorganic	
VOCs	PM	5ppm(CH4)	0-500 ppm	10atm	400℃	Most hydrocarbons, less sensitive to most inorganic	
CH/HC/VOC	PM	0.12ppm(CH4)	0-12ppm	10atm	400℃	CH4(1000), CH3CH3(100), HCl(500), CH3SH(30), C2H4(50),CH3OH(30), HCl(20), O3(.1),NO2,	OPL<6m; H2O<104*HC
CH4	WMS1	<10ppm	0-10000 ppm	10atm	400℃	CH4, C2H2,CHF3, HCN, C4H2,O2,CHF3,H2,HF	
CH4	WMS1	<10ppm	0-10000 ppm	10atm	400℃	CH4, C2H2,CHF3, HCN, C4H2,O2,CHF3,H2,HF	
CH4	WMS01	0.12ppm	0-120ppm	10atm	400℃	NH3,CO2(w),	
CH4	WMS01	0.12ppm	0-120ppm	10atm	400℃	NH3,CO2(w),	
CH4/ /HC/VOC	WMS01	0.12ppm	0-120ppm	10atm	400℃	NH3,CO2(w),	
CO2	WMS01	300ppm	0.03-30%	10atm	400℃	NH3,CO2(w),	
NH3	WMS01	0.04ppm	0.04-400ppm	10atm	400℃	NH3,CO2(w),	
CH4/ CH/HC/VOC	WMS01	0.12ppm	0-120ppm	10atm	400℃	NH3,CO2(w),	
CH4	WMS01	0.15ppm	0-180ppm	10atm	400℃	NH3,CO2(w),	
CH4	WMS01	0.06ppm	0-60ppm	10atm	400℃	CH3OH,DMS,HCs,	
CH4	WMS01	0.05ppm	0-50ppm	10atm	400℃	CH3OH,DMS,HCs,HF, CH3SH(1), CH3OH(2), NH3(3), CH4(25),CH3CH3(6), CO(1/3), C2H2(.2), C2H4(3), N2O(.1),NO2(+),H2CO(2), CS2(.2),	
CH4/HC	TM	0.03ppm	0-6 ppm	10atm	400℃	CH4(15), C2H6(0.8) ,HCl	Less interfered by HCL
CH3Br		10ppm	0-10000 ppm	10atm	400℃	C2H6,HCO,CH4,NO2,	
CH3OH	WMS01	0.9ppm	0-900ppm	10atm	400℃	CH3OH(12),water(13), CH3SH(.2),	
CH3OH	WMS01	2ppm	0-2000ppm	10atm	400℃	CH3OH(12),water(13), CH3SH(.2),	
CH3OH	WMS2	9ppm	0-900ppm	10atm	400℃	CO, CO2, H2S,HCN,H2CO, CS2, C2H2, NH3	
CH3OH	WMS1	1ppm	0-1000ppm	10atm	400℃	CH3OH(12),water(13), CH3SH(.2),	
CH3OH	WMS01	0.1ppm	0.1-100ppm	10atm	400℃	CH3OH(12),water(13), CH3SH(.2),	
CH3SH		0.01ppm	0-1000ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SH		0.06ppm	0-1000ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SH	WMS01	0.45ppm	0-450ppm	10atm	400℃	CH4, DMS, CH3OH,	
CH3SH	WMS01	0.2ppm	0.1-100ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4,many	
CH3SH	WMS01	0.45ppm	0-450ppm	10atm	400℃	NH3, CH4,CH3OH,HF,	
CH3SH		5ppm	0-5000ppm	10atm	400℃	C2H6,CH3OH,CH4	
CH3SH		0.9ppm	0-900ppm/0- 10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SH		0.9ppm	0-900ppm/0- 10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SH	WMS01	0.72ppm	0-750ppm	10atm	400℃	aromatic , CH4,NH3,CH3OH,	
CH3SH		0.9ppm	0-900ppm/0- 10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SH	WMS1	2ppm	0-2400ppm	10atm	400℃	CH4,NH3,	
CH3SH		2ppm	0-2000ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SH		18ppm	0-2%V	10atm	400℃	CO, CO2, H2S,HCN,H2CO, CS2, C2H2, NH3	

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CH3SCH3		0.008ppm	1-1000ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SCH3		0.015ppm	1-1000ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SCH3		2ppm	1-1000ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4	
CH3SCH3	WMS01	0.4ppm	400ppm	10atm	400℃	HF,CH3SH, CH3OH	
CH3SCH3	WMS01	0.18ppm	180ppm	10atm	400℃	CH4, CH3SH, CH3OH	
CH3SCH3	WMS01	0.5ppm	1-500ppm	10atm	400℃	NH3, CH4, CH3SH, CH3OH,aromatic	
CH3SCH3	WMS1	0.8ppm	1-800ppm	10atm	400℃	NH3, CH4, CH3SH, CH3OH,	
CH3SSCH3			0.1-100ppm 0-10%V	10atm	400℃	C2H6,CH3OH,CH4	
C2H2		10ppm	0-1000 ppm	10atm	400℃		
C2H2		10ppm	0-1000 ppm	10atm	400℃	O3(.2),	
C2H2/C2H6		10ppm	0-1000 ppm	10atm	400℃	O3(.2),	
C2H2		1ppm	0-100 ppm	10atm	400℃		
C2H4		1ppm	0-100 ppm	10atm	400℃	C3H6,SO2F2(),O3(0.1), H2S-, HO2-,	
C2H4		10ppm	0-1000 ppm	10atm	400℃	SO2F2(),O3(0.1), H2S-, HO2-,	
C2H4		0.1ppm	0-100 ppm	10atm	400℃		
C2H3Cl		0.1ppm	0-100 ppm	10atm	400℃		
C2H6/HC		0.05ppm	0-10 ppm/0- 100%V	10atm	400℃	CH4(10),C2H6(2.5)	
C2H5OH		1ppm	0-1000 ppm	10atm	400℃	CH4(10),C2H6(2.5)	
C2H5OH		1ppm	0-1000 ppm	10atm	400℃	CH4(10),C2H6(2.5)	
C2H5OH		0.5ppm	0-500 ppm	10atm	400℃	CH4(10),C2H6(2.5)	
C2H5OC2H5		1ppm	0-1000 ppm	10atm	400℃	CH4(10),C2H6(2.5)	
C2H5OC2H5		1ppm	0-1000 ppm	10atm	400℃	CH4(10),C2H6(2.5)	
C2H6		10ppm	0-10000 ppm	10atm	400℃	H2O,	
C2H6		10ppm	0-10000 ppm	10atm	400℃	H2O,C2H2,	
C2H6		1ppm	0-1000 ppm	10atm	400℃	CFH(CF3)2	
C2H6		0.3ppm	0-300 ppm	10atm	400℃	Hcs	
C2H6		0.4ppm	0-400ppm/0- 100%V	10atm	400℃		
C2H6O		0.1ppm	0-100ppm	10atm	400℃	H2O, CO2,CH4-	
C2H3CHO		0.1ppm	0-100ppm	10atm	400℃	SO2	
C3H4		1ppm	0-10 0ppm	10atm	400℃		
C3H6		1ppm	0-10 0ppm	10atm	400℃	C2H4	
C3H8	WMS1	1ppm	0-10 0ppm	10atm	400℃	C2H2, HCL , NO,C3H8, NO2,	
C3H8	WMS01	1ppm	0-10 0ppm	10atm	400℃	Hcs	
C4H2		1ppm	0-10 0ppm	10atm	400℃		
iC4H10	PM30	1ppm	0-10 0ppm	10atm	400℃	HCl,C2H6,C2H2,C3H4,C3H8,C2H6O,CH4, H2O	
C4H10	WMS01	0.4ppm	0-400ppm	10atm	400℃	HCl,C2H6,C2H2,C3H4,C3H8,C2H6O,CH4, H2O	
C6H6	WMS1	1ppm	0-100ppm	10atm	400℃	CO2,NH3,SO2F2,CFH(CF3)2, HF(1.5), H2CO, O3(0.1),HOBr(0.25), H2S-, NH3(),CFH(CF3)2, C2H4,	
C6H6	PM	1ppm	0-100ppm	10atm	400℃	C6H6, H2S, HCN,NO2, NH3,CH4, CHCl2F(HCFC-21)	
C6H6	WMS01	1ppm	0-100ppm	10atm	400℃		
Aromatic	WMS01	1ppm	0-100ppm	10atm	400℃	NH3,CH4,Ar	
Aromatic	WMS1	1ppm	0-100ppm	10atm	400℃	H2O,CO2,NH3,	
Aromatic		1ppm	0-100ppm	10atm	400℃		
Aromatic		1ppm	0-100ppm	10atm	400℃		
ArOH		1ppm	0-100ppm	10atm	400℃	Aromatic	
ArOH		1ppm	0-100ppm	10atm	400℃	H2S,CH4, CHCl2F(HCFC-21),N2O	
CFH(CF3)2		1ppm	0-1000ppm	10atm	200℃	C2H6.N2O(-),	
CHBr3							
CHCl2F/HCFC- 21							
CHF3				10atm	200℃		
Cl2	CWP	Cl2:80ppm SO2:10ppm		10atm	200℃	O3,SO2,Cl2;	limited

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		O3:1ppm					
O3	CWP	Cl2:80ppm SO2:10ppm O3:1ppm		10atm	200℃	O3,SO2,Cl2;	limited
ClO2		10ppm	0-10%,100%	10atm	200℃		
CO	PM	0.2ppm	0-20ppm	10atm	400℃	CO(400), C2H2(1.7), CH3OH(.4), CH3SH/0.3, N2O(), HCN(.3), NH3(0.1), CO2(.1), C2H4(.4), N2O(.2), O3(.12), H2S(.007),	
CO	WMS001	0.2ppm	0-200ppm	10atm	400℃	H2CO,CH3CH2OH,DMS,CH3SH,CH4,C2H5OC2H5,HF(.2)	
CO	WMS2	20ppm	0-20%	10atm	400℃	CO, CO2, H2S,HCN,H2CO, CS2, C2H2, NH3	
CO		10ppm		10atm	400℃		
CO		100ppm	0-1%	10atm	400℃	NO;	
CO	WMS1	1000ppm	0-20%	10atm	400℃	O3(.15),NO(),	
CO2	PM	0.1ppm	0-10ppm	10atm	400℃	CO2(800),CH3SH/0.4, CH3OH/0.5, NH3(1),H2O(10?), HCN(.2), H2S(4), N2O(1),	
CO2		0.001ppm	0-0.2 ppm, 0- 100%V	10atm	400℃	CO2(800),CH3SH/0.4, CH3OH/0.5, NH3(1),H2O(10?), HCN(.2), H2S(4), N2O(1),	
CO2	WMS01	3ppm	0-3%V	10atm	400℃	H2S(), CO(),	
CO2	WMS01	3ppm	0-3%V	10atm	400℃	H2S(), CO(),	
CO2		10ppm	0- 3000ppm,%V	10atm	400℃	HBr, H2S,CH3SCH3,NH3, HCHO,	
CO2		10ppm	0- 3000ppm,%V	10atm	400℃	HBr, H2S,CH3SCH3,NH3, HCHO,	
CO2	WMS1	30ppm	0-30%V	10atm	400℃	CO2, H2S, CO, HCN,H2CO, CS2, C2H2, NH3	
CO2	WMS1	30ppm	0-30%V	10atm	400℃	CO2, H2S, CO, HCN,H2CO, CS2, C2H2, NH3	
CO2	WMS1	1000ppm	0-20%V	10atm	400℃	COS,CH4, C4H2,O3(.15),	
CO2	WMS1	1000ppm	0-20%V	10atm	400℃	COS, SO2F2, O3(.15), H2O(0.1),	
CO2	WMS1	1000ppm	0-20%	10atm	400℃	CO2,HI,C4H2, H2O(0.07),C2H2,N2O,H2, SO2F2(), O3(.15), O3(0.1), HOBr(0.25),	
COS		0.003ppm	0-1000ppm 0-10%V	10atm	400℃		
COS		0.5ppm	0-1000ppm 0-10%V	10atm	400℃		
COS		3ppm	0-1000ppm 0-10%V	10atm	400℃		
COS		10ppm	0-1000ppm 0-10%V	10atm	400℃		
COS		10ppm	0-1000ppm 0-10%V	10atm	400℃		
CS2		0.9ppm	0-1000ppm 0-10%V	10atm	400℃		
HCN		0.2ppm	0-200	10atm	400℃	O3(.3),C2H2;	
HCO		1ppm	0-1000ppm	10atm	400℃	H2O, CO2,CH4-	
HCL		0.005ppm	0-5ppm,	10atm	400℃		
HCL	WMS01	0.5ppm	0-1000ppm,	10atm	400℃		
HCL	WMS01	0.5ppm	0-1000ppm,	10atm	400℃		
HCL	WMS1	0.07ppm	0- 15/8000ppm,	10atm	400℃	COS ,N2O(),	
HCL		0.7ppm	0- 15/8000ppm,	10atm	400℃		
HCL		1.4ppm	0- 15/8000ppm,	10atm	400℃		
HCL	WMS1	1.4ppm	0- 15/8000ppm	10atm	400℃	C2H2,NO2, NH3, C2H6,H2O	
HF	WMS01	0.01ppm	0-5/100 ppm	10atm	400℃	NH3 ,H2O	L1300
HF	WMS01	0.02ppm	0-5/100 ppm	10atm	400℃		
HF	WMS01	2ppm	0-1000 ppm	10atm	400℃		
HF	WMS04	0.01ppm	0-5/1000 ppm	10atm	400℃		
H2	WMS01	20000ppm	0-100%	10atm	400℃		

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H2						NH3,NO2	
H2				10atm	400℃	C3H4,CH4,CO2,H2O,COS, C2H2,C4H2, HCN,NH3, H2O2,O2	
H2				10atm	400℃	C2H2, C4H2, HI,CO2	
H2				10atm	400℃	COS, C2H4, C4H2	
H2O		30ppm	0-100ppm, 0-100%V	10atm	400℃	NO2+, O3(.3), NO2(33), HOBr(0.1), HO2(1),	
H2O		50ppm	0-100ppm, 0-100%V	10atm	400℃	C2H6O ,O3(.3), CO2,CH4-	
H2O	WMS1	30 ppm	0-3%V, 0-100%V	10atm	400℃	C4H2,N2O,CO2,HI,C4H2,C2H2,C4H2,H2	
H2O	WMS1	15 ppm	0-1.5%V, 0-100%V	10atm	400℃	CFH(CF3)2,N2O, H2S, C2H6,O3-,HF,	
H2O	WMS1	3 ppm	0-3000ppm, 0-100%V	10atm	400℃	CH4,H2O2,O3-,	
H2O		0.12 ppm	0-120ppm, 0-100%V	10atm	400℃	CO2,CH3OH	
H2O	TC1000	0.09 ppm	0-120ppm, 0-100%V	10atm	400℃	water(25),CH3OH(1), CH3SH(.2), HCN(2), HCl(2),H2CO(2),NO<181>	
H2O	WMS01	0.09 ppm	0-120ppm, 0-100%V	10atm	400℃	water(25),CH3OH(1), CH3SH(.2), HCN(2), HCl(2),H2CO(2),NO<181>	
H2S		0.1ppm	0-100 ppm,0-30%V	10atm	400℃	water(.1);	
H2S	WMS01	1ppm	0-1000 ppm,0-30%V	10atm	400℃	H2S, CO, CO2, HCN,H2CO, CS2, C2H2, NH3	
H2S	WMS2	4ppm	0-3000 ppm,0-30%V	10atm	400℃	H2S, CO, CO2, HCN,H2CO, CS2, C2H2, NH3	
H2CO		0.15ppm	0-30ppm/0-10%V	10atm	400℃	HCl(300),CH3OH(5), CH3SH(4?), NH3(0.2),CH3(3),CH3CH3(10), CH4(15), HCN(7-60?), C2H2(.5), H2S(0.3), N2O(3), NO2(.1), H2CO(60), CS2(1.5),	
H2CO		0.15ppm	0-30ppm/0-10%V	10atm	400℃	H2CO(13), C2H4(12), NH3(3), CH3OH(1), CH3SH(.1), N2O(.3), CS2(.25),	
HNO3		0.06ppm	0-60 ppm	10atm	400℃		
HNO3		1.2ppm	0-120 ppm	10atm	400℃		
NH3	WMS01	0.06ppm	0-60ppm	10atm	400℃	NH3(50), CH3OH(1), CH3SH(.2),H2CO(2), CS2(.25),	
NH3	WMS01	0.048ppm	0-50ppm	10atm	400℃	NH3(50), CO2(5), H2O	
NH3	WMS1	0.6ppm	0-2000ppm	10atm	400℃	NH3(50), DMS,CH3SH,CH4	
NH3	WMS1	1.8ppm	0-2000ppm	10atm	400℃	NH3(50), DMS,CH3SH,CH4	
NH3	WMS1	0.72ppm	0-1000ppm	10atm	400℃	NH3(50), CO2, CH4,C2H4	
NH3	WMS1	0.3ppm	0-300ppm	10atm	400℃	HCN,CO2,H2CO,CH3SH,CO,H2S,	CO2 <3%
NH3	WMS01	0.09ppm	0-100ppm	10atm	400℃		
NH3	WMS1	0.2ppm	0-200ppm	10atm	400℃		
NH3	WMS1	1ppm	0-1000ppm	10atm	400℃	O3(.3), NO2(33), HOBr(0.1), HO2(0.1),	
N2			0-100%			NH3()	
N2O		10ppm	0-1000ppm,	10atm	400℃	CH4,NH3	
N2O		2.2ppm	0-1000ppm,	10atm	400℃	CH4,NH3	
N2O		2.2ppm	0-1000ppm,	10atm	400℃		
N2O	WMS1	2.2ppm	0-1000ppm,	10atm	400℃	CH4,NH3,	
N2O	WMS1	10ppm	0-1000ppm,	10atm	400℃	NH3,HF, CFH(CF3)2,C2H4,H2,	
N2O	WMS1	10ppm	0-1000ppm,	10atm	400℃		
N2O	WMS1	10ppm	0-1000ppm,	10atm	400℃	H2O,	
NO		10ppm	0-1%	10atm	400℃	NO(350),SO2(250),	
NO	WMS01	5ppm	0-1000ppm	10atm	400℃		
NO	WMS01	10ppm	0-1000ppm,	10atm	400℃		
NO	WMS1	1ppm	0-1000ppm,	10atm	400℃	C2H2, CO,H2O	
NO2	WMS01	10ppb	0-1ppm,	10atm	400℃		
NO2		10ppb	0-1ppm,	10atm	400℃		

NO2		10ppb	0-1ppm,	10atm	400℃		
NO2		10ppb	0-1ppm,	10atm	400℃		
NO2		10ppb	0-1ppm,	10atm	400℃		
NO2		10ppb	0-1ppm,	10atm	400℃		
NO2	WMS04	10ppb	0-1ppm,	10atm	400℃	O2,	
NO2	WMS1	0.1ppm	0-100ppm,	10atm	400℃		
NO2		10ppb	0-1ppm,	10atm	400℃		
NO2	WMS30	10ppb	0-1ppm,	10atm	400℃		
NO2		10ppb	0-1ppm,	10atm	400℃		
O2		100ppm	0-30/100%V	10atm	400℃		
O2		100ppm	0-30/100%V	10atm	400℃		
O2	WMS01	100ppm	0-30/100%V	10atm	400℃		
O2	WMS1	100ppm	0-30/100%V	10atm	400℃	NO2	
O2	WMS01	100ppm	0-30/100%V	10atm	400℃		
O2	WMS1	100ppm	0-30/100%V	10atm	400℃	NO2	
O3		4.5ppm	0-5000ppm	10atm	400℃	H2Ovw	
Ar-OH		1ppm	0-500ppm	10atm	200℃	CH3, protein, ArNH2	
Ar-OH		1ppm	0-500ppm	10atm	200℃	Aromatic, CH2, ROH, sucrose, starch	
SO2	WMS01	0.002ppm	0-1ppm	10atm	400℃		
SO2	WMS01	0.09ppm	0-1ppm	10atm	400℃		
SO2	PM	0.001ppm	0-1ppm	10atm	400℃	CH3SH(8), CH3OH/2.5, NH3(0.5), CH4(3), HCN(.3-3), C2H2(1), H2S(.3), N2O(2?), H2CO(50),	
SO2	PM	0.01ppm	0-10ppm	10atm	400℃	C2H3CHO, NO2, O3	
SO2	PM	0.01ppm	0-10ppm	10atm	400℃	NO2, O3	
SO3	WMS1	0.1ppm					①
SiCl4	WMS1	1ppm					①
SiHCl3	WMS01	0.1ppm					①
SiH2Cl2	WMS01	0.1ppm					①
SiH3Cl	WMS01	0.1ppm					①

\*The range data is with 1 m optical path cell, unless other where specified with OL.

## Available Structure Types for Application

Type	Installation	Fixing	Fitter	Application
TR	Insertion	DN50	PN40 flange.	Fluegas analyzer, tank; Normal <60℃, <70℃ for 1 gases (Air purge)
TAR	Across reflect	DN50	PN40 flange	Low temperature container, reactor etc., Sample temperature: <200℃; Distance of transmitter and reflector: <3 m; for 1 gases; the advantage is to increase OPL in limited space
TA	Across	DN50	PN40 flange	Stove, oven, reactor, pipeline etc. original position analysis. Temperature <200 to 400℃; Wide space gas detect; Cell length: 0.1 to 6m usually Possible for 1 to 3 gases;
TA-Bf	By flow			Industry pipe line
TARS	Across space	DN50	flange	Workshop, depot, Wide space toxic or hazardous gas detect; Max transmission distance: < 30m; Possible for 2 or 3 gases;

\*the type have to be adjusted because of technical design for light path, or economic consideration.

\*Must be cooled with air, while the temperature of samples beyond 70℃.but suitable extended pipe(air cooling actually) with glass window could help usage below 120℃ without cooling.