



T-LGA4810WMS-H2O Series Laser Spectrometer

Process Gas Moisture Analyzer

Ref: T_LGA4810_H2O_IntE
Revision:2004-09-1

Both applicable to gas and liquid sample

- Rugged industrial design, real time measurement
- Continuously in situ monitoring, No gas sampling
- High selectivity by spectroscopy 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).

Special on Moisture Measurement

Any following parameters can be derived from the tested data.

Terminology	Abbrev.	Definition	Units
Absolute moisture	AH	mass water vapor / volume	g/m ³ , g/Nm ³
Volume ratio, %volume	Vr	volume water vapor / volume of wet gas	%
Partial pressure	Pp	partial pressure of water vapor	Pa
Saturation moisture	SM	maximum amount of moisture which a vapor can hold at a given temperature	g/m ³
Relative humidity	RH	Relative humidity (RH) is defined as the ratio of the water vapor partial pressure or water vapor content to the saturation vapor pressure or the maximum vapor content at the temperature of the air or gas. The saturation vapor pressure in the air varies with air temperature, the higher the temperature, the more water vapor it can hold. When saturated the relative humidity in the air is 100 %RH.	%RH

Specific quantity	Sq	mass of water vapor / mass of dry air	g/kg, kg/kg
Dew point	Dp	saturation temperature corresponding to the amount of moisture in the vapor Dewpoint is the temperature at which air becomes saturated with water and begins to condense - forming dew. Numerically, the temperature of gases at 100 % relative humidity equals the dewpoint temperature. The more negative the dewpoint temperature is from the ambient temperature, the smaller is the risk of condensation and the drier the gas or air stream.	°C

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.

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

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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/cm² 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:: ϕ 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: ϕ 50mm
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

Specifications Transducer of T-MS4810-WF Moisture Analyzer.

Product No.	Gas	LDL/1M Min Range@1m	Pressure	Temp.	Cross Interference	Information	Application
12151	H ₂ O WMS1	30 ppm 0-3%V	10atm	400°C	C ₄ H ₂ , N ₂ O, CO ₂ , HI, C ₄ H ₂ , C ₂ H ₂ , C ₄ H ₂ , H ₂	Natural gas	
11032	H ₂ O WMS1	15 ppm 0-1.5%V	10atm	400°C	CFH(CF ₃) ₂ , N ₂ O, H ₂ S, C ₂ H ₆ , O ₃ -, HF,	Natural gas	
10613	H ₂ O WMS1	3 ppm 0-3000ppm	10atm	400°C	CH ₄ , H ₂ O ₂ , O ₃ -,		

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5405	H2O	TM1000	0.09 ppm	0-120ppm	10atm	400℃	water(25),CH3OH(1), CH3SH(.2), HCN(2), HCl(2),H2CO(2),NO<181>	
5332	H2O	WMS01	0.09 ppm	0-120ppm	10atm	400℃	water(25),CH3OH(1), CH3SH(.2), HCN(2), HCl(2),H2CO(2),NO<181>	Natural gas

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

*OPL: Optical pass length from transmitter of light to the receiver; This was to be adapted for different range for users order.

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

*analyzer for unlisted gases might be designed by requirements. Such as Acetylene (C2H2),Allene (CH2CCH2), Ammonia (NH3), Butadiyne (C4H2),Butene (CH2CHCH2CH3), Carbon dioxide (CO2),Carbon disulfide (CS2),Carbon monoxide (CO),Carbon tetrachloride (CCl4),Carbonyl fluoride (COF2),Carbonyl sulfide (COS),Chlorine nitrate (ClONO2), Chlorine oxide (ClO),Chlorosulfonyl isocyanate (CSI) (ClSO2NCO),Cyanogen (C2N2),Cyclopropane (C3H6),Dimethyl sulfide (DMS) (H3CSCCH3),Dimethyl sulfoxide (DMSO) (H3CSOCH3),Ethane (CH3CH3),Ethylene (C2H4),Formaldehyde (H2CO),Formic acid (HCO2H),Hydrazine (N2H4),Hydrogen (H2),Hydrogen bromide (HBr), Hydrogen chloride (HCl),Hydrogen cyanide (HCN),Hydrogen fluoride (HF),Hydrogen iodide (HI),Hydrogen peroxide (H2O2),Hydrogen sulfide (H2S),Hydroperoxy radical (HO2),Hypobromous acid (HOBr),Hypochlorous acid (HOCl), Isobutene ((CH3)2CCH2),Methane (CH4),Methanesulfonyl chloride (CH3SO2Cl),Methanol (CH3OH), Methylamine (CH3NH2),Methyl chloride (CH3Cl),Methyl fluoride (CH3F),Methyl mercaptan (CH3SH),Nitric acid (HNO3),Nitric oxide (NO),Nitrogen (N2),Nitrogen dioxide (NO2),Nitrogen oxide cation(NO+),Nitrous oxide (N2O), Oxygen (O),Oxygen (O2), Ozone (O3),Phosphine (PH3),Propane (C3H8),Propylene (C3H6),Propyne (CH3C2H),Sulfur dioxide (SO2),Sulfur hexafluoride (SF6),Sulfuryl chloride (SO2Cl2),Sulfuryl fluoride (SO2F2), Thiophosphoryl chloride (SPCl3),Water (H2O)..

Available Structure Types for Application

Type	Installation	Fixing	Fitter	Application	
TR	Insertion	DN50	PN40 flange.	Flue, tank; Normal<60℃,<70℃ (Air purge)	for 1 gases
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 for1 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.

*Price for added parameter to TAR: 2/3 of that of standard T type's.

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