

HORIBA



Explosion-proof

INFRARED ANALYZER

EIA-51d/51p
TIA-51d/51p

Explosion-proof

THERMAL CONDUCTIVITY ANALYZER

TCA-51d/51p

Explosion-proof

MAGNETO-PNEUMATIC OXYGEN ANALYZER

MPA-51d/51p

Explosion-proof

PARAMAGNETIC OXYGEN ANALYZER

PMA-51d



Advanced technologies that provides safety

The 51 series advanced explosion-proof analyzers represents HORIBA's extensive experience and specialized know-how to provide the safety, reliability, and accuracy demanded in analyzing flammable gases or operating in explosive environments. To realize the highest levels of safety and operability, the 51 series offers an intuitive interface with a clearly visible display. The extensive line-up for the 51 series covers a wide range of applications including infrared gas analyzers for general-purpose processes and models for use with oxygen and hydrogen. The HORIBA 51 series meets the needs of gas analysis in environments where safety, reliability, and accuracy are paramount.



Focused on functionality

- Meets diverse gas analysis requirements
- Offers a clearly visible and easy-to-operate user interface

Line-ups

Infrared Analyzer

EIA-51d/51p for high/middle concentration

TIA-51d/51p for low concentration

For measurements in flammable gases and explosive atmospheres

Applications

- Oil and gas chemicals production
- Ammonia production plant
- Steelmaking by-product gas/Heat treatment
- Sulfuric acid plant etc.

Industrial Gases

Thermal Conductivity Analyzer

TCA-51d/51p

For measurements in flammable gases and explosive atmospheres

Applications

- Air Separation Unit
- Hydrogen-cooled turbine generator
- Ammonia production plant
- Petrochemical industry
- Chemical industry
- Steel plant
- Hydrogenated Oil Refinery Plant etc.

H₂

Magneto-Pneumatic Oxygen Analyzer

MPA-51d/51p

Paramagnetic Oxygen Analyzer

PMA-51d

For O₂ measurement in combustion control

Applications

- City gas
- Petrochemical industry
- Cement industry
- Air Separation Unit etc.

O₂

Certification

Japanese explosion-proof certification (JPEX)

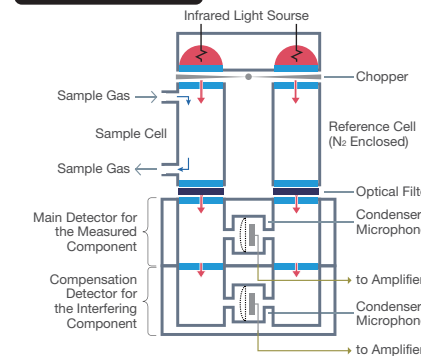
EIA-51d : TC19049, EIA-51p : TC19050, TIA-51d : TC18891, TIA-51p : TC18892,
TCA-51d : TC19081, TCA-51p : TC19113, MPA-51d : TC19054, MPA-51p : TC19054, PMA-51d : TC19055

Measuring Principles

EIA-51d/51p · TIA-51d/51p

Non-Dispersive Infrared Absorption Method (NDIR) (Dual-beam method with condenser microphone)

Conceptual diagram



Measuring principle

Non-dispersive infrared absorption (NDIR) is a method using infrared absorption of molecules. This method is used to measure the concentration of various gas components that actively absorb infrared. When infrared radiation is absorbed by a molecule, it increases the temperature of that molecule. The wavelength of infrared radiation absorbed differs depending on the molecule. NDIR uses infrared radiation containing wavelengths in mid-infrared radiation of 2.5-25 μm to measure the concentration of gas components. The infrared absorption amount depends on the concentration of absorbing gas molecules. This relationship is expressed by Lambert-Beer law.

Features

- NDIR can be used for a variety of gas components.
- NDIR of dual-beam method with condenser microphone can measure the gas component faster with higher accuracy than normal NDIR.

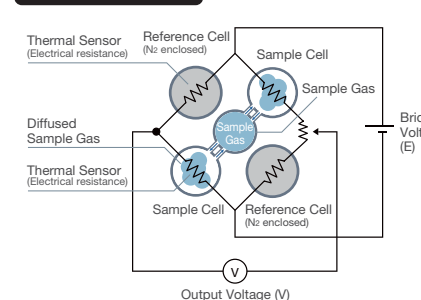
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TCA-51d/51p

Thermal Conductivity Detector Method (TCD)

Conceptual diagram



Measuring principle

The thermal conductivity detector method (TCD) uses the inherent characteristics of gases for the thermal transfer to measure gas concentrations. By using a thermal wire sensor, such as a heated platinum wire, the change in temperature due to the variation in thermal conductivity of the sample gas is detected as a change in electrical resistance. This allows for the concentration measurement of the measured component gas in the sample gas. TCD is also characterized by measuring using a bridge circuit to detect changes of electric resistance with high accuracy. Hydrogen (H₂), which has a particularly high thermal conductivity, is a typical measured component for TCD.

Features

- TCD is often used for continuous hydrogen gas measurement in explosion-proof areas.

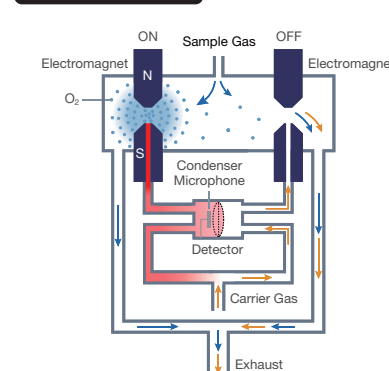
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MPA-51d/51p

Paramagnetic Method : Magneto-Pneumatic type (Double magnetic field)

Conceptual diagram



Measuring principle

The measuring principle utilizes the extremely strong paramagnetism* of oxygen. When oxygen (a paramagnetic gas) is present in a magnetic field, it is attracted to the stronger magnetic field and increases the pressure in that area. In general, the pressure increase (ΔP) at that time can be expressed by the following equation. This pressure increase is detected, and the oxygen concentration is measured.

$$\Delta P = \frac{1}{2} H^2 \cdot X \cdot C$$
(H : strength of magnetic field, X : magnetic susceptibility of a paramagnetism* gas (oxygen), C : difference of concentration between a paramagnetism* gas (oxygen) and a carrier gas (air/nitrogen))

Features

- Since the sample gas does not directly contact with the detector, it is highly resistant to corrosion and other deterioration, ensuring stable long-term and maintenance-free operation.
- Oxygen concentration can be measured with high sensitivity even in cases when flammable gases exist in the sample gas.

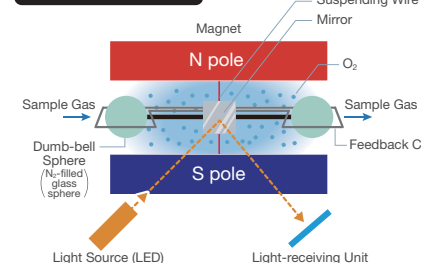
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PMA-51d

Paramagnetic Method : Dumb-Bell type

Conceptual diagram



Measuring principle

The paramagnetic method is a measuring principle that utilizes the extremely strong paramagnetism* of oxygen. The dumb-bell type of the oxygen analyzer uses this property to detect the oxygen attracted by the movement of a dumb-bell connected to two nitrogen-filled glass spheres with a glass rod.

Features

- The simple detector mechanism realizes long-term stable operation when the sample gas does not contain corrosive gases.
- Oxygen concentration can be measured even when flammable gases exist in the sample gas.
- No carrier gas required.

Read more



*Paramagnetism : A material that is not magnetized in the absence of a magnetic field but is magnetized in the direction of the magnetic field when a magnetic field is present.

■Specification

Model			EIA-51d	EIA-51p	TIA-51d	TIA-51p	TCA-51d	TCA-51p	MPA-51d	MPA-51p	PMA-51d
Type of protection			Exd II B+H ₂ T4	Expx II T4X	Exd II B+H ₂ T4	Expx II T4X	Exd II B+H ₂ T4	Expxd II T4X	Exd II B+H ₂ T4	Expx II T4X	Exd II B+H ₂ T4
Frameproof enclosures			●		●		●		●		●
Pressurized apparatus				●		●		●		●	
Measuring principle			Non-Dispersive Infrared Absorption Method (NDIR)				Thermal Conductivity Detector Method (TCD)		Paramagnetic (magneto-pneumatic type)		Paramagnetic (dumb-bell type)
Component			CO, CO ₂ , CH ₄ , etc.*1				H ₂		O ₂		
Measurement range	Minimum range		0 to 0.11 vol% (Depends on the component)		0 to 50 ppm (Depends on the component)		0 to 10 vol%		0 to 5 vol%		
	Maximam range		0 to 100 vol% (Depends on the component)		0 to 2000 ppm (Depends on the component)		0 to 100 vol%		0 to 25 vol%		
	Optional		100-90 to 50 vol% (Depends on the component)		0-20 to within less than 50 ppm (Depends on the component)	—	0-1 to within less than 10 vol%100-90 to 50 vol%	0-1 to within less than 5 vol%		—	
Range Ratio			—		—		—		Max.1:25Max.4 range		Max.1: 5
Performance	Repeatability	Standard range	Zero : ±0.5% of full scale		Zero : ±0.5% of full scale		Zero : ±1.0% of full scale		Zero : ±0.5% of full scale		Zero : ±0.1 vol% O ₂
			Span : ±0.5% of full scale		Span : ±0.5% of full scale		Span : ±1.0% of full scale		Span : ±0.5% of full scale		Span : ±0.1 vol% O ₂
		Optional range	Zero : ±0.5% of full scale		Zero : ±1.0% of full scale		Zero : ±1.0% of full scale		Zero : ±1.0% of full scale		—
			Span : ±0.5% of full scale		Span : ±1.0% of full scale		Span : ±1.0% of full scale		Span : ±1.0% of full scale		
	Linearity		±1.0% of full scale								
	Drift*2	Standard range	Zero : ±2.0% of full scale/week						Zero : ±1.0% of full scale/week		Zero : ±0.05% vol% O ₂ /week
			Span : ±2.0% of full scale/week						Span : ±2.0% of full scale/week		Span : ±0.05% vol% O ₂ /week
		Optional range	Varies by specification				Varies by specification		Zero : ±1.0% of full scale/week		Varies by specification
	Span : ±3.0% of full scale/week										
	Response time (from inlet of analyzer)				T ₉₀ within 20 seconds T ₉₀ within 40 seconds (TIA optional range)		T ₉₀ within 20 seconds				
Sample gas Condition	Gas composition	Flameproof enclosures	O ₂ : 21% or less, no mist, no dust The hazardous must be equivalent or less with electrical apparatus group II B, gas and vapor-air mixture corresponding to temperature code T4, and Hydrogen-air mixture.								
		Pressurized apparatus	O ₂ : 21% or less, no mist, no dust The ignition temperature must be equivalent or less with electrical apparatus of gas and vapor-air mixture corresponding to temperature code T4.				O ₂ : 21% or less, no mist, no dust The hazardous must be equivalent or less with electrical apparatus of group II C gas and vapor-air mixture corresponding to temperature code T4.		O ₂ : 21% or less, no mist, no dust The ignition temperature must be equivalent or less with electrical apparatus of gas and vapor-air mixture corresponding to temperature code T4.		
	Pressure		Over 1.98 kPa						14.7 to 24.5 kPa		Over 1.98 kPa
	Flow rate		Approx. 500 mL/min.						Approx. 1.5 L/min		Approx. 300 mL/min
	Temperature		Ambient temperature								
	Exhaust		Atmosphere pressure								
Materials in contract with sample gas			SUS304, SUS316, FKM, CaF ₂ , Au, etc.				SUS304, SUS316, FKM, glass, SiO ₂ , AU		SUS304, SUS316, FKM		SUS304, SUS316, Pt, glass, FKM
Calibration method			Standard : Manual correction, Option : Automatic correction								
Analog output	Output content / Output specifications		1 concentration output channel / DC 4 to 20 mA (DC 0 to 16 mA / 0 to 20 mA, DC 0 to 1 V / 0 to 5 V / 1 to 5 V / 0 to 10 V optional)								
	Alarm setting		Arbitrary setting is available with span range from -10% to +110% of output for current and voltage. Negative output values set to zero.								
Contact Input-output (option)			6 channels								
Digital connection (option)	Interface		RS-485								
	Protocol		Modbus-RTU								
	Communication speed		Selected from 19200 bps / 9600 bps / 4800 bps / 2400 bps / 1200 bps								
Environment conditions	Location		Indoors								
	Operational Temperature		-5 to 40 °C (away from direct sunlight and radiant heat)								
	Humidity		90% or less								
	Vibration		Avoid large vibration sources (less than 100 Hz; 0.3 m/s ²)								
Utility	Protective gas for Pressurized apparatus composition		Gas composition : N ₂ , Gas pressure : 196 to 690 kPa, Gas flow rate : 10 L/min. (when purging), 500 mL/min. (when operating) Dew Point : -30°C Saturated or less								

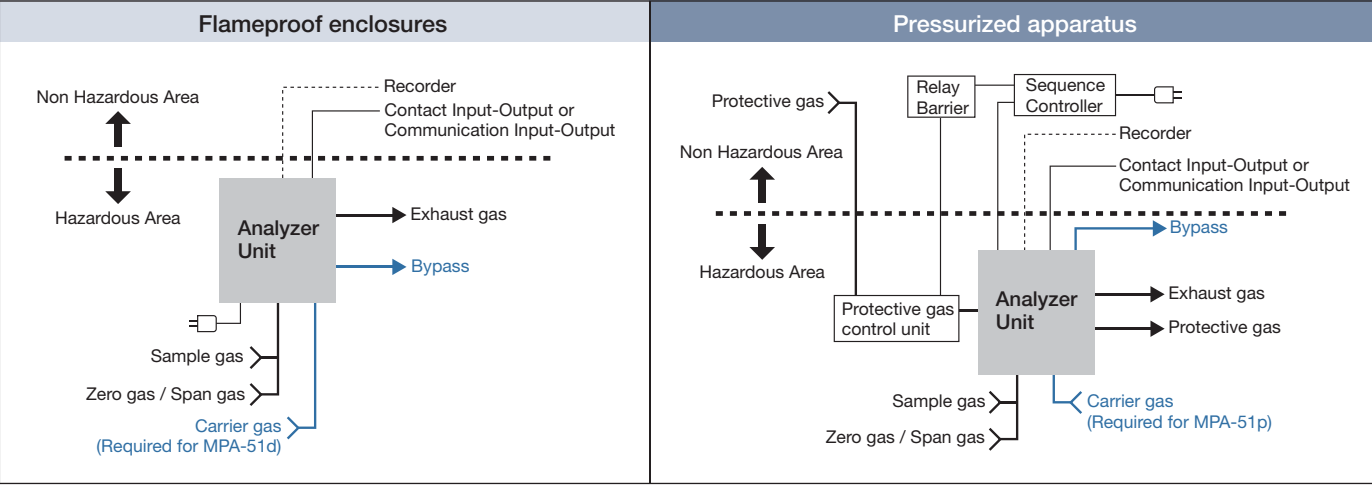
*1 Please consult HORIBA for measurement of the other components. *2 Guaranteed at normal ambient temp. ±5°C

■Recommended Measuring Ranges

	EIA-51d/51p		TIA-51d/51p	
	Min. Range	Max. Range	Min. Range	Max. Range
CO	0 to 0.21 %	0 to 100 %	0 to 50 ppm	0 to 2000 ppm
CO ₂	0 to 0.11 %	0 to 100 %	0 to 50 ppm	0 to 1000 ppm
CH ₄	0 to 0.21 %	0 to 100 %	0 to 50 ppm	0 to 2000 ppm
C ₃ O ₈	0 to 0.051 %	0 to 100 %	0 to 50 ppm	0 to 500 ppm
NO	0 to 0.21 %	0 to 100 %	0 to 100 ppm	0 to 2000 ppm
SO ₂	0 to 0.051 %	0 to 100 %	0 to 100 ppm	0 to 500 ppm

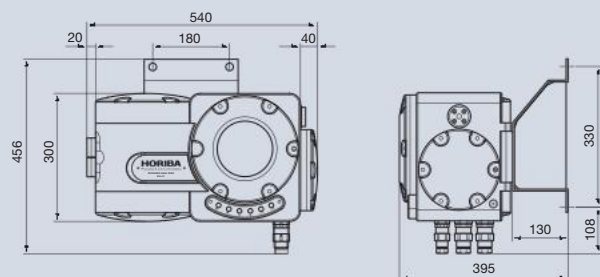
Please consult HORIBA for applications other than those listed above.

■System configuration

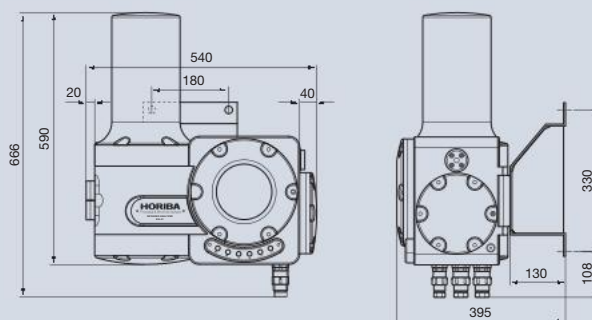


■ Dimensional Outlines unit: mm

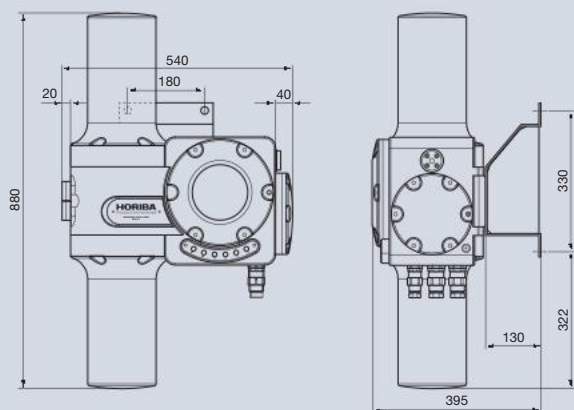
MPA-51d/p · TCA-51d/51p · EIA-51d/51p · PMA-51d



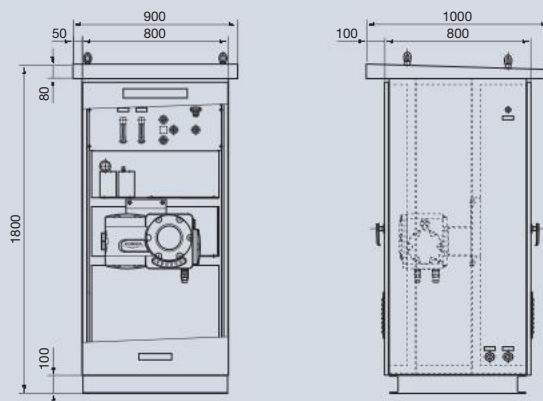
EIA-51d/51p



TIA-51d/51p

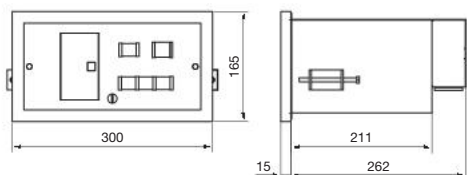


Enclosure

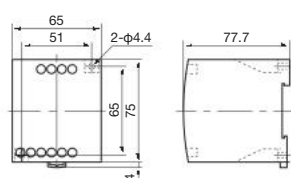


■ Peripheral instruments (Required for Pressurized apparatus)

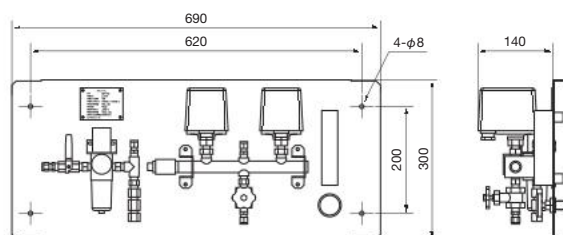
Sequence Controller



Relay Barrier



Protective gas control unit



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 ISO45001. We have now integrated Business Continuity Management System ISO22301 in order to provide our products and services in a stable manner, even in emergencies.



Please read the operation manual before using this product to assure safe and proper handling of the product.

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