



Recorder



Flow



Pressure



Temp



Analyzer



Level

Datasheet

Total Phosphorus (TP) Analyzer

AI-ME-TP



## Datasheet

### Total Phosphorus (TP) Analyzer AI-ME-TP

The Total Phosphorus (hereinafter referred to as TP) Analyzer is a new-generation monitoring instrument developed by our company. It is designed for continuous and accurate measurement of total phosphorus in various water samples and is widely applicable in environmental protection monitoring at pollution discharge outlets, municipal and industrial wastewater treatment, and water used in industrial production processes.

#### Applications

- Environmental discharge outlets
- Municipal wastewater
- Industrial effluents
- Water used in industrial processes

#### Features

- **Highly Integrated Structure:** the all-in-one digestion module and integrated plunger pump design help to reduce component wear, enhance stability, and extend the service life of the equipment.
- **Standardized Quick Connection:** Modular components with plug-and-play capability simplify installation and maintenance, significantly reducing operation and maintenance costs.
- **Intelligent Anti-fouling Compensation Algorithm:** Based on the water sample onsite, the system features an automatic anti-fouling mode to deliver reliable and accurate monitoring results.



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- **Innovative Reagent Mixing Technology:** Ensures thorough reaction between the water sample and reagents, improving measurement accuracy.
- **Industry-Specific Customization:** Optimized reagent formulations and detection sequences tailored for various industries such as chemical manufacturing, municipal wastewater, and electroplating, ensuring broad applicability.
- **Fully Automated Intelligent Monitoring:** Supports automatic calibration, cleaning, and sample injection. In case of unexpected interruptions, the system can resume operation automatically, ensuring continuous monitoring.
- **Reagent Shortage Detection and Alarm:** Automatically detects insufficient water or reagent supply to prevent reagent-free measurements.
- **Flexible Measurement Modes:** Supports both real-time online monitoring and batch sampling to meet the needs of different application scenarios.
- **Seamless Data Integration:** Monitoring data is automatically stored and uploaded in real time to regulatory platforms, supporting efficient decision-making.

### Measuring principle

In nature, phosphorus exists mainly in the form of various phosphates, including orthophosphate, condensed phosphate, and organically bound phosphorus. These may be found dissolved in water, attached to humus particles, or contained within aquatic organisms. “Total phosphorus” (TP) refers to the total amount of phosphorus present in a water sample after digestion, during which all forms of phosphorus are converted into orthophosphate. The result is expressed as milligrams of phosphorus per liter of water.

Phosphorus is an essential nutrient for biological growth, yet excessive discharge poses significant risks to both human health and the environment. To safeguard water resources and curb these risks, total phosphorus has been designated as a mandatory parameter in national environmental monitoring.

Major sources of phosphorus include industrial, agricultural, and domestic activities—for example, wastewater from food processing, smelting, and detergent manufacturing; the use of phosphate-containing pesticides and fertilizers; and large-scale domestic use of phosphate-based synthetic detergents.

#### Analytical principle:

##### (1) Digestion & Conversion

For total phosphorus (TP) analysis, the water sample is first thoroughly mixed with potassium

persulfate ( $K_2S_2O_8$ , **oxidant**) and subjected to sealed digestion under high temperature and pressure, during which all forms of phosphorus are oxidized into orthophosphate ions ( $PO_4^{3-}$ ).

## (2) Colorimetric Detection

In the acidic medium, the orthophosphate ions ( $PO_4^{3-}$ ) then react with ammonium molybdate ( $(NH_4)_6MO_7O_{24}$ ) and potassium antimonyl tartrate ( $K(SbO)C_4H_4O_6$ , **catalyst**) to form a yellow phosphomolybdate complex. This complex is then reduced by ascorbic acid ( $C_6H_8O_6$ , **reducing agent**) to produce a stable blue-colored compound known as molybdenum blue.

The analyzer photometrically measures the absorbance of the solution, which is proportional to the total phosphorus concentration in the sample, and automatically determines the total phosphorus value.

The analyzer's measuring principle is fully compliant with the national standard GB 11893-89 "Water Quality—Determination of Total Phosphorus—Ammonium Molybdate Spectrophotometric Method" and the industry standard HJ/T 103-2003 "The Technical Requirement for Water Quality Automatic Analyzer of Total Phosphorous".

<b>Parameters</b>	
<b>Performance parameters</b>	
Measured variables	Total Phosphorus
Measuring range	(0~2) mg/L; (0~5) mg/L; (0~10) mg/L; Note: The range can be switched online
Repeatability	≤ 10 %
Zero drift	±5%
Range drift	±10%
Linearity	±10%
Comparison test with the actual water sample	± 10%
Voltage stability	±10%
<b>Output</b>	
Current output	(4~20)mA output
Communication	RS232, RS485, RJ45 interface
<b>Electrical specifications</b>	
Power supply	( 220±22) VAC, (50±0.5) Hz
Power consumption	≤100W
Insulation resistance	≥20M Ω
Dielectric strength	The power inlet and chassis of the analyzer can withstand a 50Hz, 1.5kV AC(rms) test voltage for 1 minute with a current limit of 5 mA, without flashover or breakdown.
Leakage current	≤5mA
<b>Process conditions</b>	
Water sample temperature	(0~50)°C
<b>Environmental conditions</b>	
Ambient temperature	(5~40)°C
Relative humidity	≤90% (no condensation)
<b>Construction</b>	
Dimensions	315mm×239.5mm×500mm (D×W×H)
Weight	20kg
Material	Cold-rolled SPCC
Fixing method	Install on a flat, level platform

**Table 1 Function**

No.	Project	Content
1	Measurement mode	Online mode, maintenance mode, remote control mode
2	Continuous running time	$\geq 720\text{h/time}$
3	Automatic calibration	Calibration interval can be set from 1 to 999 hours, at any desired time
4	Automatic cleaning	Automatic cleaning after each measurement; periodic cleaning can be performed according to the complexity of the on-site water sample
5	Range switching	Realize online switching of different ranges according to the measured value.
6	Liquid level detection	Detects sample and reagent levels; alerts for insufficient liquid
7	Online fitting	Selectable fitting method based on application requirements
8	User interface	Full color touchscreen, with resolution $1024 \times 600$
9	Data storage	Continuously store data for more than 5 years
10	Communication	RS232/RS485/ RJ45/CAN, etc.
11	USB drive	Upgrade via USB flash drive
12	Other features	Reagent shortage warning, system logs, and fault alarms.

## Dimensions

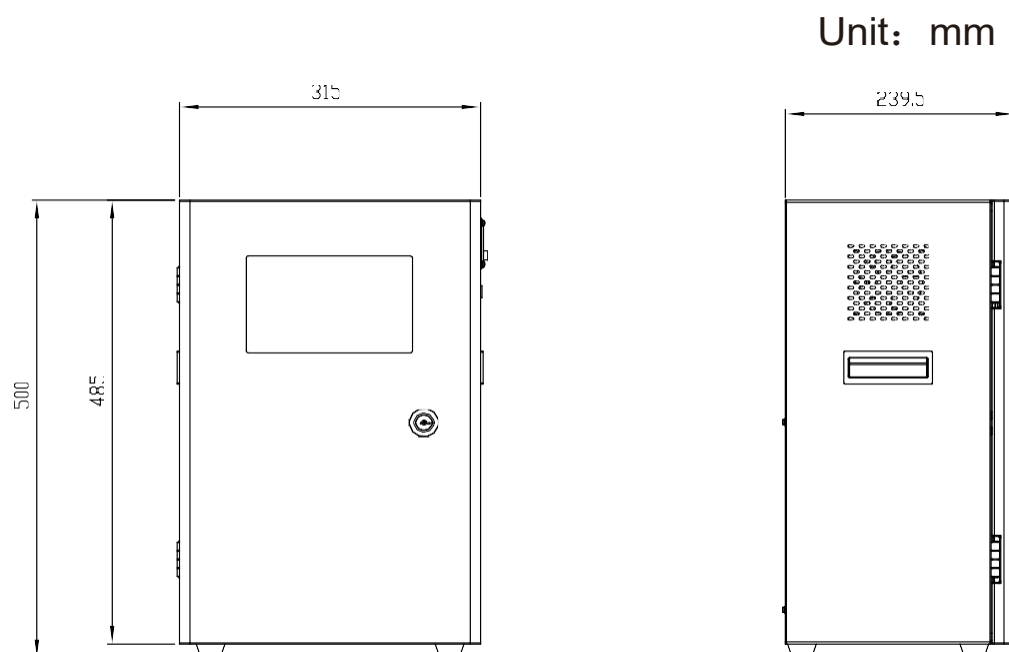


Fig.1 Dimensions (unit: mm)

The internal structure of the IMN analyzer is shown as below:

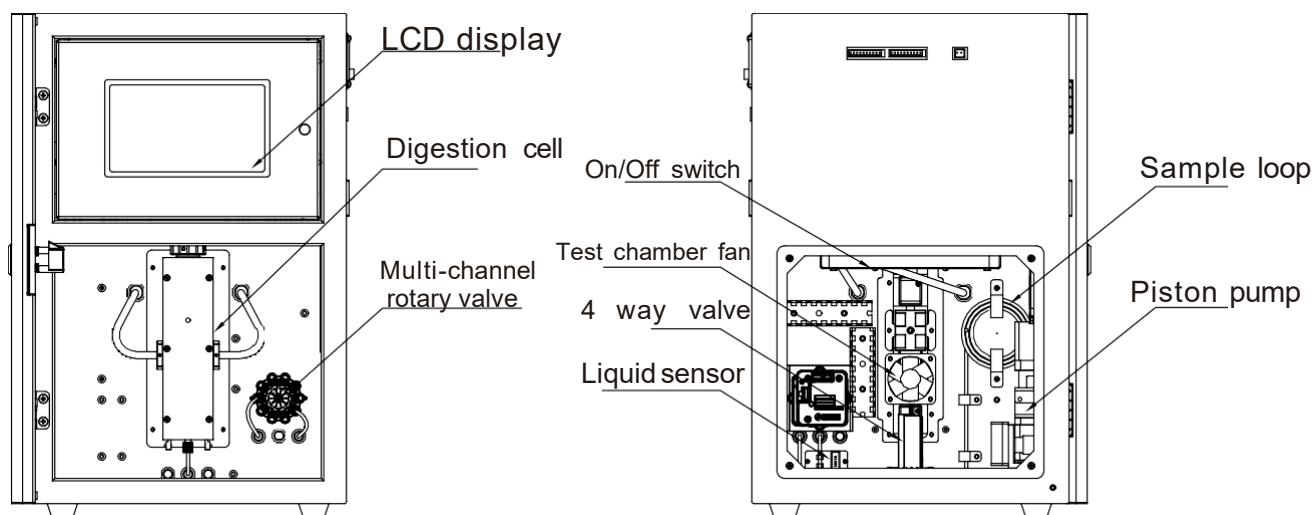


Fig.2 The diagram of the analyzer's internal structure

Wiring

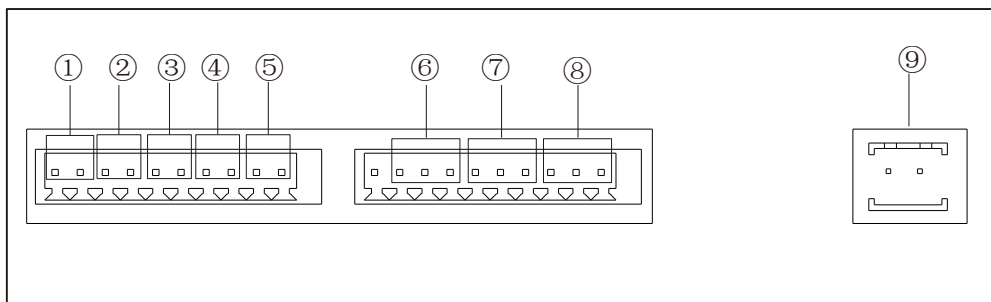


Fig.3 Diagram of the back panel interface

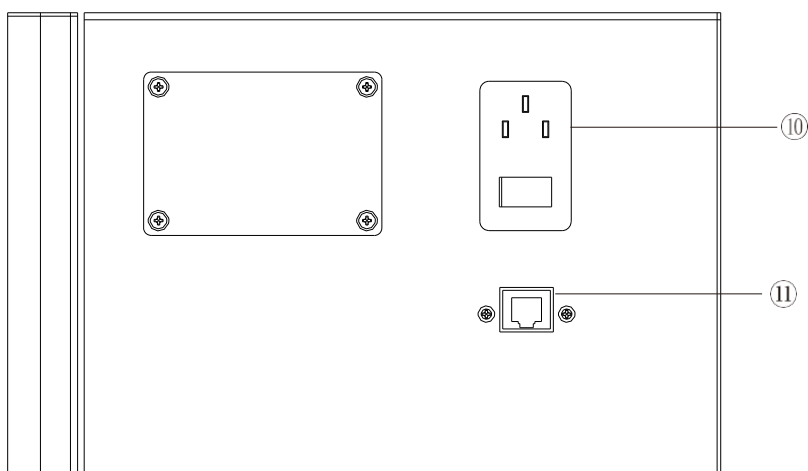


Fig.4 Diagram of the ports on the analyzer's right side

**Table 2 Interface description**

No.	Interface	Specification and description
1	Reserved port	/
2	Analog output	Used to output analog signals with external instruments
3	24V input	24VDC power input
4	24V output	Supply power to sensors and low-voltage displays
5	CAN interface	CAN interface
6	Mainboard RS232	Mainboard RS232 output interface
7	Screen RS232	Screen RS232 output interface
8	Screen RS485	Screen RS485 output interface
9	24V output	Supply power to sensors and low-voltage displays
10	Power inlet	Pure copper, national standard-compliant three-core 1 mm <sup>2</sup> power cord, which is the main power cord of the instrument
11	Network cable interface	Standard RJ45 network interface, wired access to the Internet or VPN network communication

## Ordering Code

AI-ME-TP												Description	
ME-TP	-	-	-	-	-	-	-	-	-	-	-	-	
	WA												0-2mg/L
Measuring	WB												0-5mg/L
Range	DC												0-10mg/L
	XX												Others
Output	G												4-20mA + RS485 + RS232 + RJ45
Switch output		1											1 channel
Power supply			E										220VAC
Housing material and protection level				7									SPCC cold-rolled sheet, IP00
Standard solution						S1							2 mg/L
						S3							5 mg/L
						S4							10 mg/L
						XX							Others



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