

Life Cycle Cost Reduction

For compliance with the total emission control and enhancing the value of compliance-focused companies



## Automatic Total Nitrogen/ Phosphorus Monitoring System

# TPNA-500

Life Cycle Cost (LCC) Reduction

Achieving significant reduction in maintenance man-hours



# A state-of-the-art model adopting 60 years of water measurement technology, which achieves a reduction in life cycle costs, and compliance with regulations and corporate compliance.

More than 10 years have passed since the 5th Japanese Waste Water Regulation was enforced in 2001. From the perspective on preservation of ambient water quality, it has become a matter of course for companies to be compliant with regulations and observe corporate compliance. Total nitrogen and total phosphorus monitoring in the future has the potential to lead to proactive enhancement of corporate value, in addition to compliance with regulations. While we propose technological innovations and improvements and LCC reductions, we will pursue the future where regulations are strictly observed and corporate value is improved through monitoring.

## Features Life Cycle Cost (LCC)\*<sup>1</sup> Reduction

POINT  
1

### Adoption of stain resistant measurement system

While adopting a reduced reagent volume (1/10) realized by our conventional model, employing a new measurement method (meniscus measurement method) and enhanced automatic washing functions (optional) have been achieved, contributing to lengthening the maintenance cycle.



POINT  
2

### Reduction in power consumption by approximately 30%, and pure water and waste water to 1/2

We have reduced the cost for electricity, use of pure water and waste water treatment (including labor) as well as environmental burden (as compared with our conventional product).

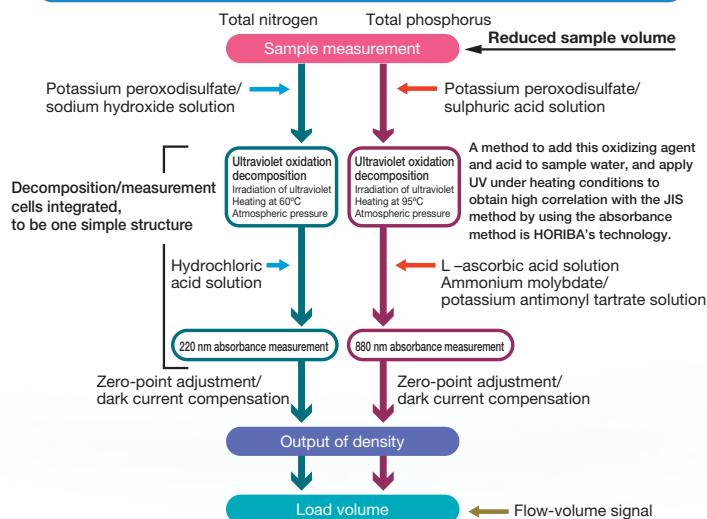


## Others

- **A variety of washing functions:** sampling point backwash purge function, line washing function during reagent change, automatic sample line washing function\*<sup>2</sup>
- **Ultraviolet oxidation decomposition method:** Japanese market share of approximately 60%. No. 1 in the industry\*<sup>3</sup>
- **Color touch panel:** Improved visibility and operability.
- **A built-in load volume operation function**
- **USB data output port**

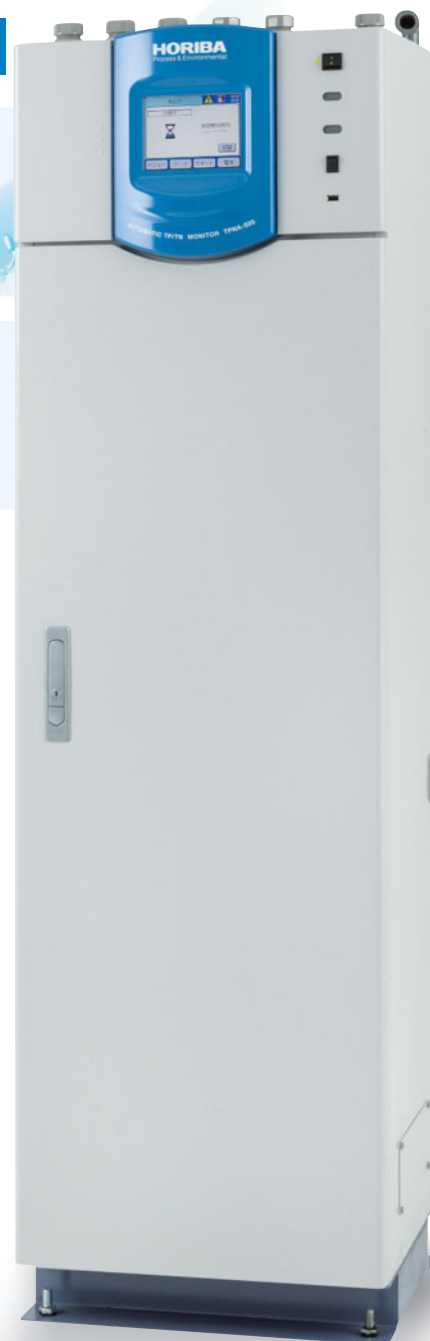
## Thoroughly pursuing usability and reliability with multiple patents!

### Measurement flow: Measurement method utilizing our propriety technology



### Related patents

- Total Nitrogen and/or Total Phosphorus Monitoring System JP Patent No. 4691266
- Total Nitrogen Measuring Method JP Patent No. 4078223
- Methods to Compensate for the Effects of Disturbance by Seawater on Measurement of Total Nitrogen in Seawater JP Patent No. 3093633



\*<sup>1</sup> Life Cycle Cost (LCC): Total cost required for this product from purchase to disposal. Total sum of product cost, installation cost, utility cost (electricity and water), running cost (reagent, waste water treatment, parts and man-hours), maintenance cost (regular overhauls and irregular man-hours), dismantling cost, disposal cost, etc.

\*<sup>2</sup> Hydraulic acid washing is optional.

\*<sup>3</sup> As of November, 2013. Based on our company's research.

We offer meticulous support to meet customer needs from installation space to maintenance. "TPNA-500"

### Standard Type

**Easy installation that requires only preparation of pure water in a plastic container.**

Pure water prepared in a plastic container can be used. Although customers are required to prepare pure water, this installation is applicable at any site, independent of tap water quality.



### Built-In Pure Water Supply Type

**For customers requiring both maintenance free and space-saving**

Recommended for customers who want to reduce maintenance costs. Selection of this type eliminates the necessity for weekly preparation of pure water. This space-saving unit makes maintenance free operation possible by ionizing tap water into pure water.



### External Pure Water Supply Type

**No maintenance required with automatic supply of pure water from tap water.**

An external pure water device type is recommended for customers who have sufficient installation space. Maintenance is not required for one year until the ion exchange membrane is replaced.



### Three-Component Monitoring Type

**Measurement of three components regulated by total emission control is concentrated into a space for one conventional COD analyzer**

Recommended for customers who have used a combination of a UV monitor and a total nitrogen/phosphorus monitor. Data from the UV monitor is processed by TPNA-500.

\* You can choose the installation location for a UV monitor.



## Printer

Equipped with an automatic winding function.

## Reagent Measuring Unit

## Reaction Cell

This is a cell in which reaction takes place between total nitrogen and total phosphorus. After decomposition, absorbance is measured and converted into total nitrogen and total phosphorus densities.

## Waste Water Tank

When the tank becomes full of waste water, the contact output for "Waste Liquid Tank Full Alarm" is triggered. The tank capacity is 20 liters.

## Operation Unit

Displays measurement results such as measurement values, time, measurement points, as well as operation guidance on setting conditions, maintenance, adjustment, and guidance on alarm content, function keys, etc. A touch panel is employed so that you can directly operate via screen.

## Reagent Measuring Unit

Measures the amount of various reagents to be injected (patent pending).

## Reagent Tank

A reagent tank is stored. It has an approximate two-month storage capacity. When the reagent level has become low, an alarm will be triggered.



## Proposal for preprocessing according to sample conditions

Sampling according to SS density  
(Reference)

0 50 100 150 200 mg/L

Final discharge

Intermediate processing of industrial effluent process

Sample with high density SS

Low density SS

High density SS

Overflow tank



Cyclone method (OF-3)

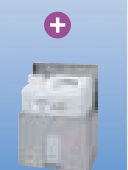


Flow-volume flow method (OF-30)

Washing unit

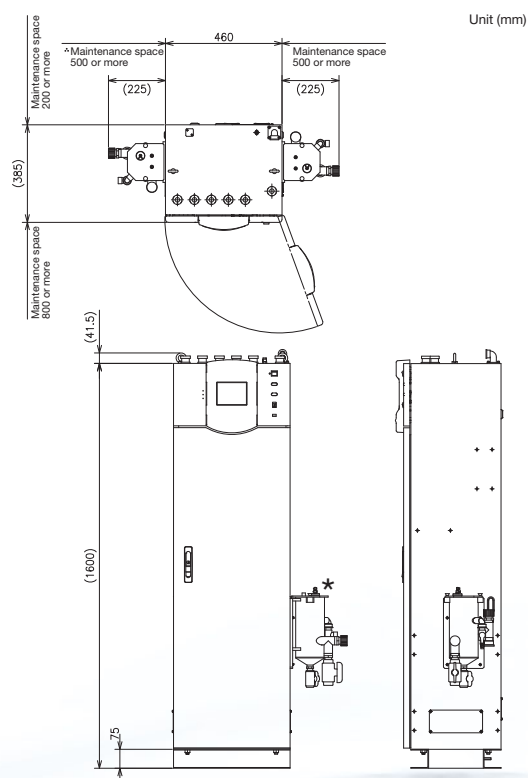


YT-5 reagent tank



YT-5 reagent tank

## Dimensional Outline Drawing





|                            |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                  |
|----------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General Specifications     | Name                                           | Automatic Total Nitrogen/Phosphorus Monitoring System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                  |
|                            | Model                                          | TPNA-500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                  |
|                            | External dimensions*1                          | 460 mm(W)×385 mm(D)×1600 mm(H)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                  |
|                            | Weight                                         | Approx. 90 kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                  |
|                            | Power                                          | AC 100 V~240 V±10% 50/60 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                  |
|                            | Electric power consumption                     | AC 100 V~240 V: Approx. 250 VA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                  |
| Performance                | Measuring range*2                              | Total nitrogen: 0~2/5/10/20/50/100/200/500/1000 mgN/L<br>Total phosphorus: 0~0.5/1/2/5/10/20/50/100/250 mgP/L                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                  |
|                            | Repeatability                                  | Within ±3% full scale (Total nitrogen full scale: 50 mgN/L or lower and Total phosphorus full scale: 10 mgP/L or lower)<br>Within ±5% full scale (Total nitrogen full scale: 100~1000 mgN/L and Total phosphorus full scale: 20~250mgP/L)<br>Condition: using standardized solution                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                  |
|                            | Measurement principle                          | Total nitrogen: Alkaline potassium peroxodisulfate UV oxidation — UV absorption method<br>Total phosphorus: Potassium peroxodisulfate UV oxidation — molybdenum blue absorption method                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                  |
|                            | Number of measured components                  | 1 point (standard), 2 points (optional)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                  |
|                            | Number of measuring ranges*3                   | 1 range (standard), 2 ranges (optional)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                  |
|                            | Measurement interval                           | 60 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                  |
| Installation environment   | Ambient temperature                            | 2~40℃                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                  |
|                            | Ambient humidity                               | Relative humidity: 85% max. (without condensation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                  |
|                            | Ambient environment                            | Well ventilated indoor location without exposure to direct sunlight.<br>Transient overvoltage of main power source: Overvoltage category II (IEC60364-44) Pollution level 2<br>Flat and stable location with minimized vibrations and shocks.<br>Atmosphere free from dust, mist, corrosive gas, etc.                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                  |
| Measuring conditions       | Sample water conditions*4,5,6,7,8              | Temperature: 2 to 40℃ (without freezing)<br>Flow rate: 0.5 to 5 L/min(when OF-3 or OF-4 is used), 5~20L/min (when OF-30 or OF-40 is used)                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                  |
|                            | Pure water<br>Conditions of tap water supply*9 | Usage volume Consumption: 43 L/month *This may increase/decrease depending on the measurement range (depends on measurement ranges and the setup of cleaning function)<br>Condition: When pure water is supplied by a customer, should be JIS K0557 (1998)*10 A2 or higher and should not contain nitrogen or phosphorus compounds.<br>When using deionizer, adherence to criteria of tap water in Water Supply Act*11 is required.<br>Supply method: Fixed water tank (standard), continuous supply via pure water supply system (optional)<br>Supply pressure: 0.1~0.5MPa |                                                                                                                                                                                                                                                                                  |
| Input/output specification | Analog output                                  | Number of points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Standard: 4 points, Optional (3 component spec / 2 points spec): 8 points                                                                                                                                                                                                        |
|                            |                                                | Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Standard: 4-20mA DC, 0-16mA DC (Default setting is 4-20mA DC, On-screen switching to 0-16mA DC is available) Optional: 0-1V DC, 1-5V DC                                                                                                                                          |
|                            |                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Standard: TN concentration, TP concentration, TN load, TP load, time flow rate<br>Optional (three-component spec): COD concentration, COD load, instant concentration of COD<br>*Output contents of COD vary according to a device conditions.                                   |
|                            |                                                | Output impedance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 500 Ω max.                                                                                                                                                                                                                                                                       |
|                            | Contact output                                 | Number of points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Standard: 16 points, Optional (3 component spec / 2 points spec): 22 points                                                                                                                                                                                                      |
|                            |                                                | Format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Non voltage contact output                                                                                                                                                                                                                                                       |
|                            |                                                | Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Insulated output                                                                                                                                                                                                                                                                 |
|                            |                                                | Output capacity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 250V AC, 3A / 30V DC, 3A (only 30V DC, 3A are available for "maintenance" contact.)                                                                                                                                                                                              |
|                            | Warning output                                 | Status output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Meas., Cal., Standby, Maintenance, Synchro. Idle 1, Synchro. Idle 2, Power, etc.                                                                                                                                                                                                 |
|                            |                                                | Warning output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Limit warnings (concentration of TP, TN, COD), H.Li limit warnings (concentration of TP, TN, COD),<br>Hi Load Limit warnings (TP, TN, COD), Sample Lack, No blank water, Reagent Lack, Span solution Lack,<br>Waste water tank full, Total Alarm 1-6, various gauge errors, etc. |
|                            | Analog input                                   | Number of points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Standard: 1 point, Optional (3 component spec / 2 points spec): 2 points                                                                                                                                                                                                         |
|                            |                                                | Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Standard: 4-20mA DC, Optional: 1-5V DC                                                                                                                                                                                                                                           |
|                            | Contact input                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Flow signal (full scale setting is available optionally), Concentration of UV/COD monitor                                                                                                                                                                                        |
|                            |                                                | Number of points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Standard: 9 points, Optional (3 component spec / 2 points spec): 18 points                                                                                                                                                                                                       |
|                            |                                                | Format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Non voltage a contact input (open collector is available)                                                                                                                                                                                                                        |
|                            |                                                | Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Insulated type input: common to (-) side                                                                                                                                                                                                                                         |
|                            |                                                | ON resistance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 100 Ω max.                                                                                                                                                                                                                                                                       |
|                            |                                                | Open voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 26V DC max.                                                                                                                                                                                                                                                                      |
|                            |                                                | Short-circuit current                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 13 mA DC max.                                                                                                                                                                                                                                                                    |
|                            |                                                | Functions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Meas. Start, Cal. Start, Cleaning Start, Modify Date, Line Select, Flow Mainte, Flow Err.,<br>Flow Power OFF, Flow No Drain, UV/COD Mainte, UV/COD Err., UV/COD Power OFF, etc.                                                                                                  |
| Functions                  | Display                                        | LCD color touch panel display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                  |
|                            | Load calculation                               | Standard: TP, TN load calculation, Optional: COD, 2 points load calculation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                  |
|                            | Memory                                         | Measurement values(including daily report and time signal): more than 1 year, Number of alarm records: 100,<br>Number of calibration records: 100, Number of operation records: 100<br>*The data can be exported through USB interface.                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                  |
|                            | Communication                                  | Standard: RS-485, Optional: RS-232C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                  |
|                            | Communication protocol                         | Modbus® *12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                  |
|                            | Printer                                        | Standard (58 mm); with automatic take-up device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                  |

\*1 Compatible with the channel base of former products TPNA-300/PN-100 series (standard)

\*2 The value of "Total Nitrogen full scale ÷ Total Phosphorous full scale" must be between 0.2 and 100.

\*3 The first range must be low concentrations, and for the same components measured, the value of "the full scale of second range ÷ the full scale of first range" must be between 1 and 50. This formula is applicable to both Nitrogen &amp; Phosphorous. This calculation must be of same component.

\*4 A seawater adjustment function (optional) is available for when seawater is mixed in.

\*5 A sample line chemical washing function (optional) is also available depending on sample conditions.

\*6 The auxiliary overflow tank can be installed to the right or left or at the back of the system main body.

\*7 The auxiliary overflow tank should be within 1m from the system main body.

\*8 Should not contain components that affect measurement such as metal ions.

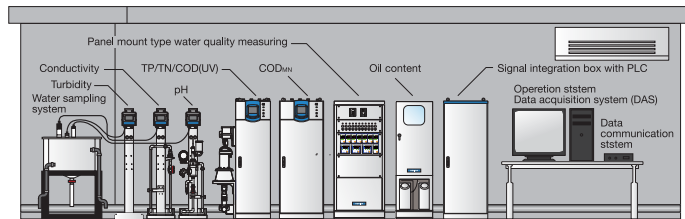
\*9 When tap water is supplied, make sure to conduct flushing for approximately 30 minutes before introducing tap water into equipment.

\*10 Without nitrogen or phosphorus compounds, Conductivity: 0.1 mS/cm max., TOC: 0.5 mg/L max. Please consult separately concerning pure water conditions.

\*11 TOC: 3 mg/L max., Nitrate-nitrogen: 10 mg/L max., Nitrite-nitrogen: 10 mg/L max. Please consult separately concerning tap water conditions.

\*12, Modbus is a registered trademark of Schneider Automation Inc.

## Water Quality Monitoring System



- CODA-500: Automatic Chemical Oxygen Demand (COD<sub>Mn</sub>) monitor,
- TPNA-500: Total nitrogen and total phosphorus concentration analyzer,
- OPSA-150 (COD(UV)): Organic Pollutant Monitor with the principle of ultraviolet ray absorption by organic matters
- pH analyzer
- Conductivity analyzer
- Turbidity analyzer
- Water sampling system
- Operation system
- Data acquisition system (DAS)
- Data communication system
- Shelter and other equipment



## Related Products

### UV Monitor OPSA-150

This is a compact, lightweight, maintenance free UV monitor developed to comply with the Total Water Contaminants Regulation and continuously measuring organic matters in sample water such as industrial effluents, river water and seawater. Stable measurements are possible through use of our proprietary Rotary Cell Length Modulation method.

Outputting converted COD values is also possible. Combination with TPNA-500 enables measurement of three elements (total nitrogen, total phosphorus and COD) required to comply with the Total Water Contaminants Regulation.



### Automatic COD Analyzer CODA-500

This is a fully automatic COD analyzer with a measurement system adopted based on JIS. Through use of the most appropriate dispensing and measuring method, the amount of reagent required has been successfully reduced to one-tenth, while the conventional measuring precision is maintained. In addition, using the reagent delivery service eliminates the necessity for time-consuming mixing of a reagent. As a result, time required to change a reagent can be reduced, and running cost can also be reduced to approximately 1/2 as compared with our conventional product.



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

- The specifications, appearance or other aspects of products in this catalog are subject to change without notice.
- Please contact us with enquiries concerning further details on the products in this catalog.
- The color of the actual products may differ from the color pictured in this catalog due to printing limitations.
- It is strictly forbidden to copy the content of this catalog in part or in full.
- The screen displays shown on products in this catalog have been inserted into the photographs through compositing.
- All brand names, product names and service names in this catalog are trademarks or registered trademarks of their respective companies.