

## TOTAL NITROGEN / TOTAL PHOSPHORUS / COD AUTOMATIC MEASURING EQUIPMENT

NPW-400

This equipment is used to monitor effluent at plants and sites and to automatically measure total nitrogen (TN), total phosphorus (TP), and COD concentrations in response to total water quality regulations.

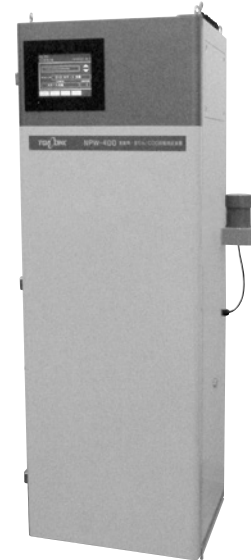
This device is based on the measurement method of total nitrogen and total phosphorus in Notification No. 64 of the Ministry of the Environment (currently Ministry of the Environment) of 1974, "Testing method for wastewater standards set by the Minister of the Environment based on the provisions of the ministry ordinance that sets wastewater standards". I "120°C potassium persulfate decomposition method-measurement of total nitrogen by ultraviolet absorptiometry" and "120°C potassium peroxodisulfate decomposition method-measurement of total phosphorus by molybdenum absorptiometry" are adopted.

In addition, confirm that COD is well correlated with the designated measurement method (JIS K 0102 Plant Wastewater Test Method 17. Oxygen consumption by potassium permanganate at 100°C) by ultraviolet absorption spectrophotometry.

One-channel, one-range, and three-item measurements are standard for this instrument.

### Features

- Reagent replacement is 40% less than that of our conventional products. Treatment of waste liquid is performed once every two months\*, and the volume of waste liquid is reduced to approximately 7.5L/months.
- By using the same heat decomposition method as the designated measurement method at 120°C for 30 minutes, it provides good agreement with manual analysis.
- Three items of TN, TP, COD (UVs) can be measured at once using a multi-wavelength detector
- COD (UV) is equipped with an internal intermittent measurement as standard. As it is common with total nitrogen and total phosphorus, there are no replacement parts dedicated to COD (UV) such as a light source lamp.
- Compact design with simple sample and reagent measurement units
- Integrated manifold piping realizes simple configuration



- Heat decomposer can decompose sample equivalent to autoclaved method (120°C, 2 atm.) by original simple design.
- Front operation without rear piping
- \* This applies when pure water is supplied with the optional internal or external purifier. The specification with a built-in pure water tank requires pure water supply once every 7 days.

### Standard Specifications

Product Name	: Total nitrogen / total phosphorus / COD automatic measuring device
Model	: NPW-400
Measurement Object	: Total nitrogen / total phosphorus / COD concentration in water
Measurement Method	: TN; Alkaline potassium peroxodisulfate Decomposition (120°C, 30 minutes) - Ultraviolet absorptiometry TP; Decomposition of potassium peroxodisulfate (120°C, 30 minutes) - molybdenum blue (ascorbic acid) Absorptiometry COD; two-wavelength absorbance spectrophotometry (ultraviolet light 254 nm/visible light 546nm).

Measurement Range :

10 mm cell	Minimum	Maximum
TN	0 to 5mg/L	0 to 50mg/L
TP	0 to 2mg/L	0 to 20mg/L
COD	0 to 1 Abs or 0 or 2 Abs COD standard: 0 to 200mg/L or less	
20 mm cell	Minimum	Maximum
TN	0 to 2mg/L	0 to 25mg/L
TP	0 to 0.5mg/L	0 to 10 mg/L
COD	0 to 0.5Abs 0 or 1Abs COD standard: 0 to 100mg/L or less	
5 mm cell	Minimum	Maximum
TN	0 to 100mg/L	0 to 200mg/L
TP	0 to 5mg/L	0 to 20mg/L
COD	0 to 1Abs or 0 to 2Abs COD standard: 0 to 500mg/L or less	

Repeatability :

10 mm cell		
TN	0 to 50mg/L	Within ±3%FS
TP	0 to 20mg/L	Within ±3%FS
COD	±2%FS	
20 mm cell		
TN	0 to 25mg/L	Within ±3%FS
TP	0 to 10mg/L	Within ±3%FS
COD	±2%FS	
5mm cell		
TN	0 to 100mg/L	Within ±3%FS
	0 to (over 100 up to 200mg/L)	Within ±5%FS
TP	Up to 0 to 20 mg/L	Within ±3%FS
COD	±2%FS	

Measurement cycle : 1 measurement / 1 hour (daily measurement schedule can be arbitrarily set in 1 hour units)

Measurement point : 1 flow path

Load calculation : Built-in

Displaying method : operation by touch panel, display by switching between year / month / day, time, measured value, load amount, operation state, printing items of printer (option), etc.

Calibration method : Manual and automatic calibration using calibration solution, and calibration using external signals are also possible.

Warm-up time : 1 hour after energization and water application

Main unit data memory : Measured value, flow value, and load value for one month can be displayed

Analogue input signal : Measured flow rate input; DC 4 to 20mA

Analogue output signal : Measured value / 3 items each; DC 4 to 20mA, 600Ω or less  
Load weight / 3 items each; DC 4 to 20mA, 600Ω or less

Contact input signal : External measurement start signal, External calibration start signal (2 to 5 seconds each make time), no drainage (flowmeter), Flowmeter maintenance in progress signal, Novoltage contact input, ON resistance 50 Ω or less, Shortcircuit current max. 9mA, Open-circuit voltage DC 12V

Contact output signal : Measuring value alarm (3 items), Load (3 items), Serious failure, Minor failure, Maintenance in progress, Calibration in progress, Power supply, Pre-processing control, Measuring in progress are selected and assigned (duplicate assignable), Power-off is fixed to contact 13.

Contact Capacitance  
; DC 24V, 0.3A or less  
AC 100V, 0.1A or less

Ambient temperature : 2 to 40°C, 85% (RH) or less and humidity

Sample water conditions : Flow rate; 1 to 3 L/min (actual usage approx. 60mL/1 measurement)  
Temperature; 2 to 40°C  
Pressure; 0.02 to 0.05MPa

- When the content of seawater is high, bromine is a positive error for total nitrogen measurement, and chlorine is a negative error for total phosphorus measurement. Notify our salespersons of the percentage of seawater content and the measurement range of total nitrogen and total phosphorus.
- COD is measured by the ultraviolet absorbance method, and the value of COD is displayed using the conversion formula obtained from the correlation with the designated measurement method (JIS K 0102 Plant Wastewater Test Method). Make sure that good correlation is obtained beforehand.
- COD (UV) is also measured once per hour. If the reading fluctuates greatly within an hour, consider using a NPW-410 type with a built-in UV-meter.
- Do not contain components or bubbles that generate corrosive gases (refer to the option column).

Reagent consumption : (2 months consumption for 1 hour /1 measurement)

Potassium peroxodisulfate solution; approx. 3.4L sodium hydroxide solution; approx. 0.5L  
Hydrochloric acid solution; approx. 0.6L (without hydrochloric acid wash)  
ammonium molybdate solution; approx. 0.5L  
L-ascorbic acid solution; about 0.5L

Waste liquid rate : Approx. 15L/2months

Power supply : AC 100V±10V, 50/60 Hz

Power consumption : 500VA (max), 150W (avrg)

Structure : IPX2, floor installation type

External dimension : 500 (W) ×450 (D) ×1500 (H) mm (excluding water receiving tank)

Coating color : Munsell 5PB8/1 equivalent

Weight : Approx. 95kg (excluding reagents)

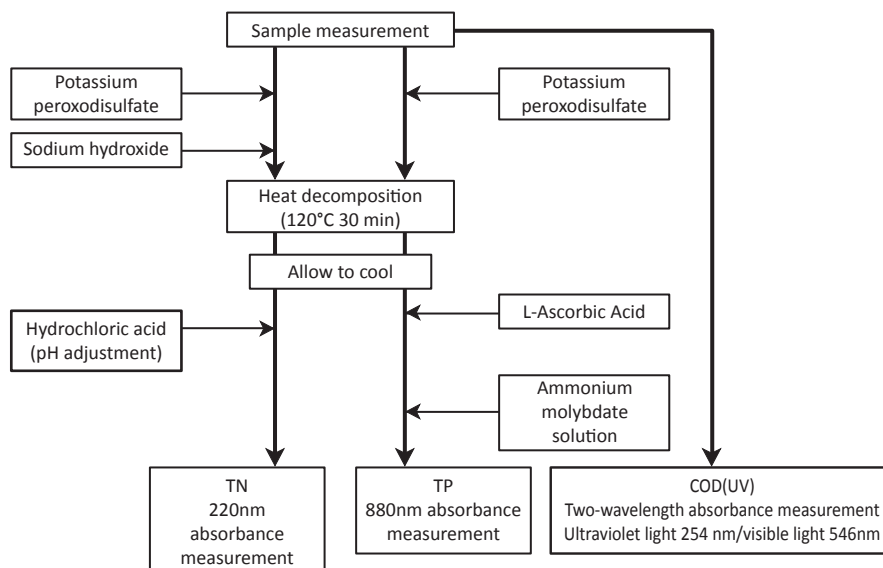
### Utility

Tap water condition : Required when optional purifier is built in  
 Temperature; 2 to 40°C  
 Pressure; 0.1 to 0.35MPa

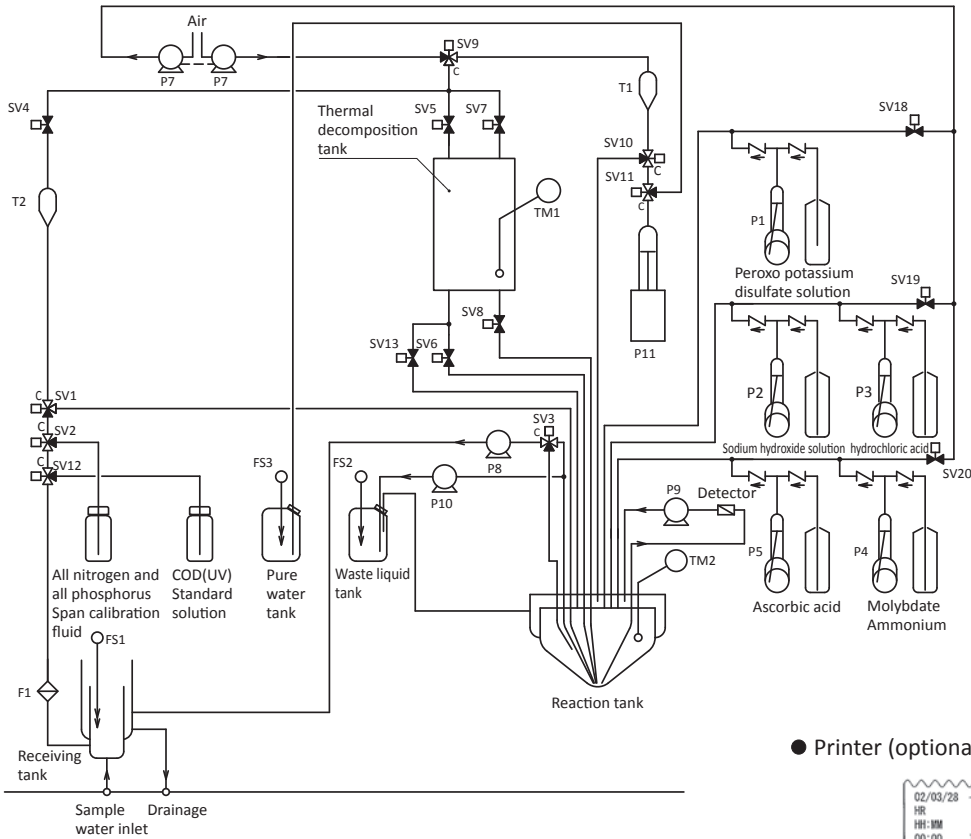
### Option

Communication function	: RS-48 (Communication protocol: Modbus/RTD) or RS-232C (Communication protocol: Original) (For detailed specifications, contact a sales office.)	USB memory	: year / month / day, time, measured value, flow value, load value for 5 years
Deionizer	: Without using the built-in deionized water tank, the deionizer can be installed internally or separately.	Adjustment tank	: If the sample water is heavily soiled, bubbles are large, or the flow rate fluctuates greatly, an adjustment tank (separate installation) is required in front of the instrument receiver tank.
Chassis Air Purge	: When the sample water contains corrosive components such as sulfur and hydrogen sulfide, it is recommended for instrument protection. Supplied air; instrumented air (dedusted and dehumidified air) pressure; 0.1MPa Usage; approx. 3.5L/ content	External dilution equipment	: Equipment: Required when the measurement range is 200mg/L or more for total nitrogen and 20mg/L or more for total phosphorus. For high-density liquids, it may be necessary irrespective of the measurement range. Contact our salesperson.
Printer	: Printer that records measured values, etc (alphabetical printing, with take-up device) Printed items; year / month / day, time, measured value, load, flow rate, daily report (max / min / year, etc.), abnormal information printing	Door locking mechanism	: Select this when necessary for the control of chemicals such as operating reagents.

### Measurement operation



### Flow sheet



Code	Name
SV1to13, 18 to 20	Solenoid valve
P1 to 5	Reagent pump
P7	Air pump
P8 to 10	Liquid transfer pump
P11	Pulse pump
T1	Buffer tank
T2	Reservoir tank
TM1, 2	Temperature sensor
F1	Filter
FS1 to 3	Float switch

### ● Printer (optional) print sample

HR	TN (mg/L)	TP (mg/L)	COD (mg/L)
00:00	28.4	2.69	0.07
00:00	TP	0.136	2.69
00:00	COD	32.9	2.69
01:00	TN	25.6	2.55
01:00	TP	0.133	2.55
01:00	COD	30.5	2.55
02:00	TN	28.4	2.69
02:00	TP	0.136	2.69
02:00	COD	32.9	2.69
03:00	TN	25.6	2.55
03:00	TP	0.133	2.55
03:00	COD	30.5	2.55
04:00	TN	28.4	2.69
04:00	TP	0.136	2.69
04:00	COD	32.9	2.69
05:00	TN	25.6	2.55
05:00	TP	0.133	2.55
05:00	COD	30.5	2.55
...	...	...	...
22:00	TN	28.4	2.69
22:00	TP	0.136	2.69
22:00	COD	32.9	2.69
23:00	TN	25.6	2.55
23:00	TP	0.133	2.55
23:00	COD	30.5	2.55

	TN (mg/L)	TP (mg/L)	COD (mg/L)
MAX.	30.2	0.141	35.4
MIN.	24.6	0.126	28.6
AVE.	28.2	0.135	32.3

	TN (kg/h)	TP (kg/h)	COD (kg/h)
MAX.	2.69	0.08	0.09
MIN.	2.37	0.06	0.07
AVE.	2.52	0.07	0.08

	TN (mg/d)	TP (mg/d)	COD (mg/d)
MAX.	28.3	60.5	1.71
MIN.	0.132	60.5	0.01
AVE.	32.2	60.5	1.95

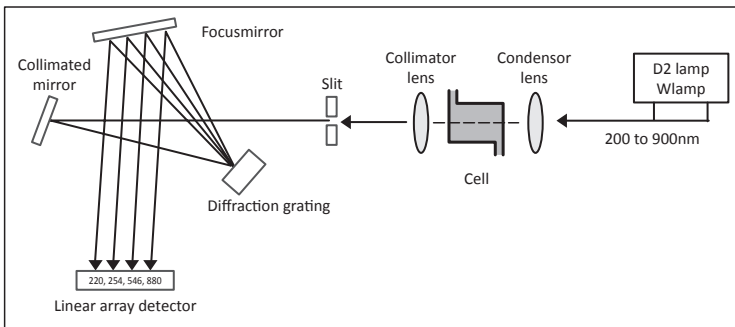
Daily report of concentration measurement value  
 Max.  
 Min.  
 Avg.

Daily report of load amount  
 Max.  
 Min.  
 Avg.

Daily average concentration  
 Daily integrated flow rate  
 Daily load amount

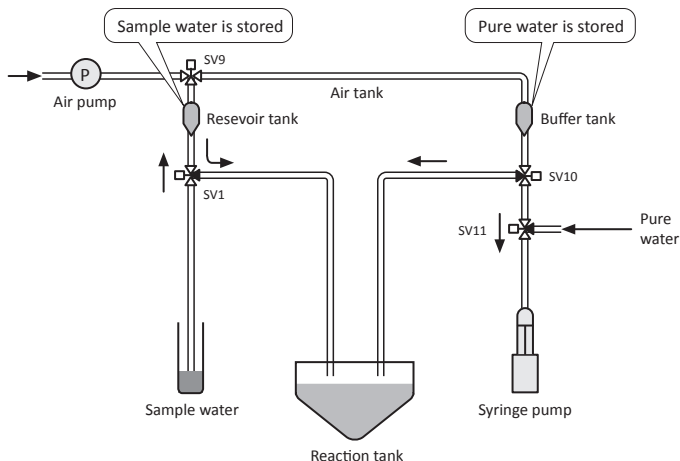
Daily report (Example of Mar.28,2002)

### Optical system using multi-wavelength detector



Optical system diagram of multi-wavelength detector

### Sample weighing system

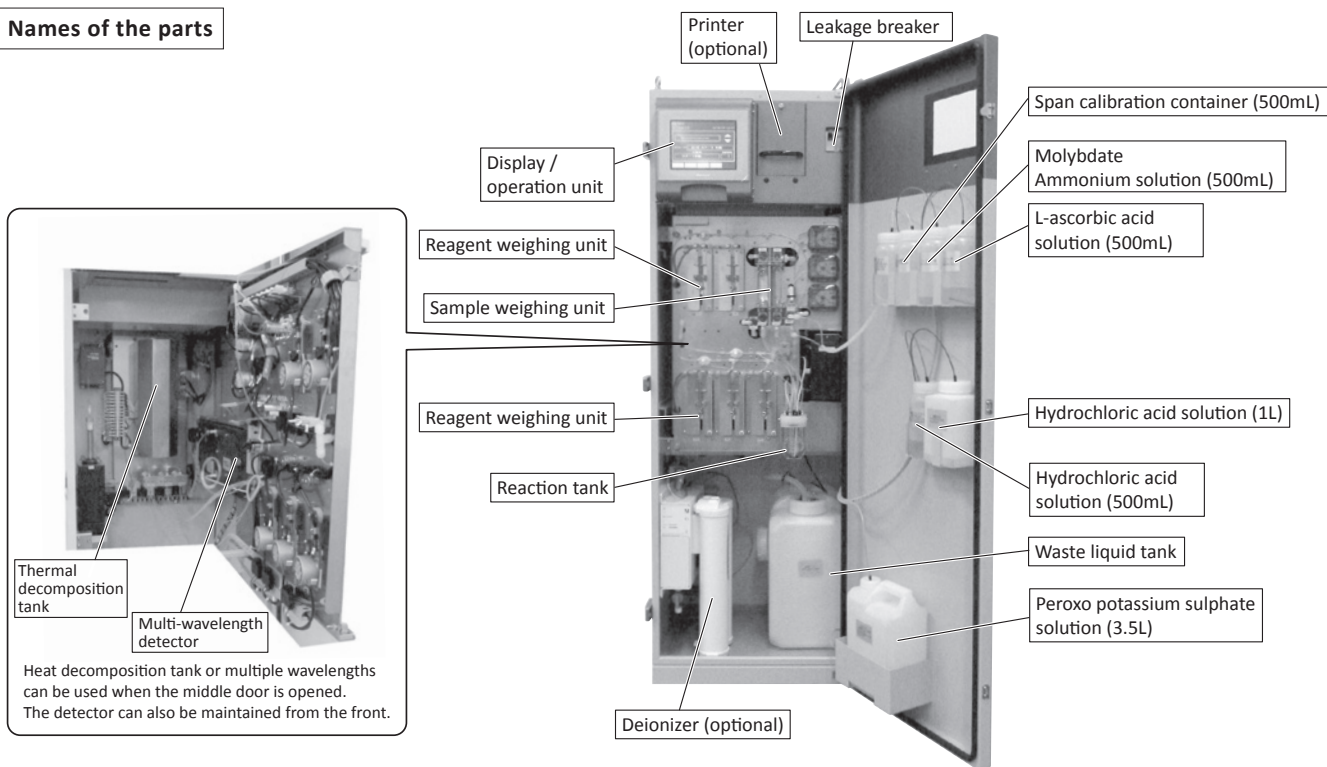


### Accurate measurement with a small amount of sample

The syringe pump for measuring sample water and diluted water (pure water) is the heart of the analysis section, and high precision is required for measurement.

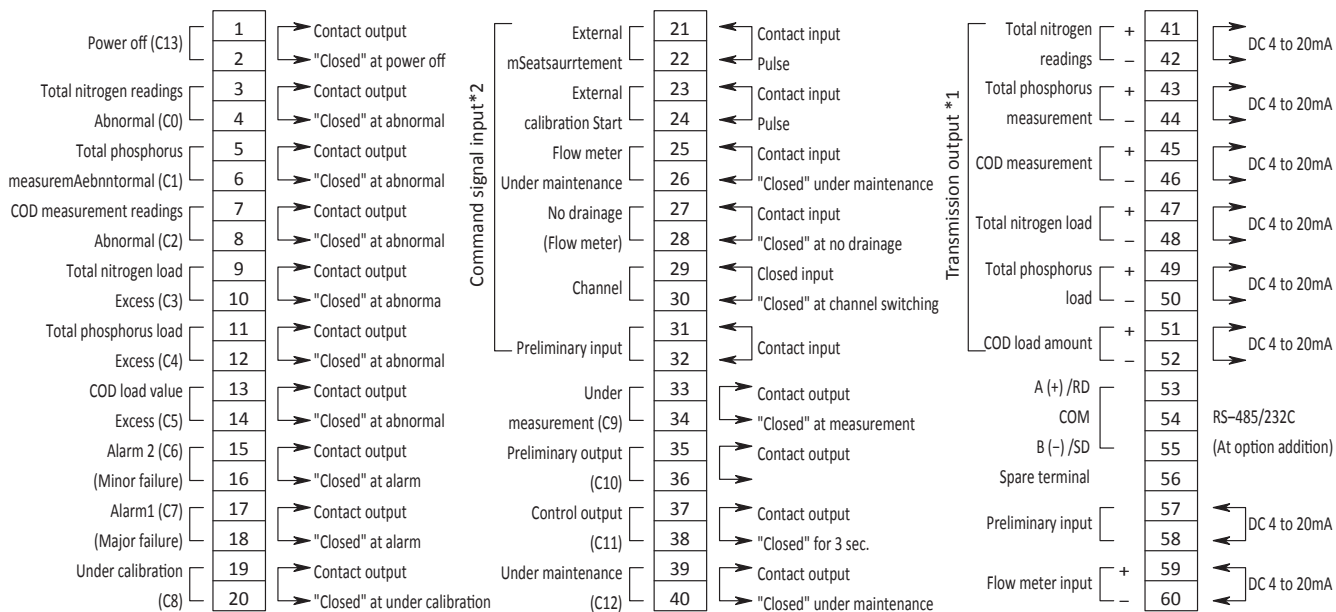
In order to reduce the amount of reagents used, it is necessary to accurately weigh a small amount of sample water and maintain its accuracy. Our sample weighing unit is constructed so that sample water does not enter the syringe pump, and is hardly affected by fouling.

### Names of the parts



Heat decomposition tank or multiple wavelengths can be used when the middle door is opened. The detector can also be maintained from the front.

### Terminal wiring diagram



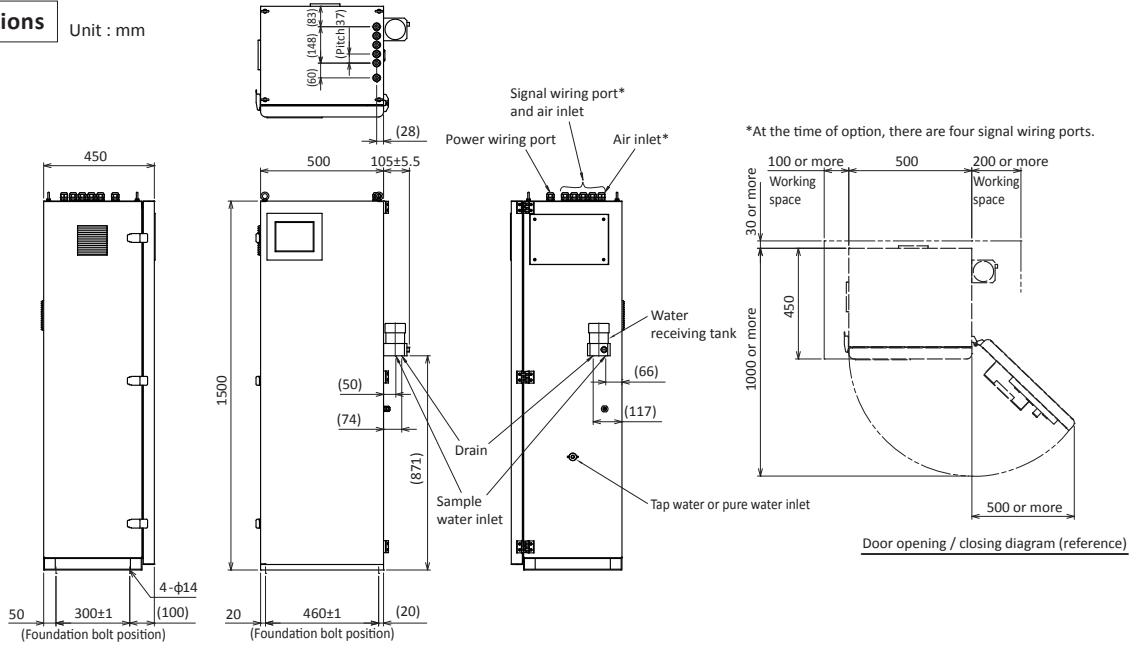
The contents of contact output C0 to C12 can be changed. Contact output C13 (power-off) cannot be changed. Each content can be assigned to one contact in duplicate. One content cannot be assigned to multiple contacts.

\*1 Transmission output is non-insulated between each CH

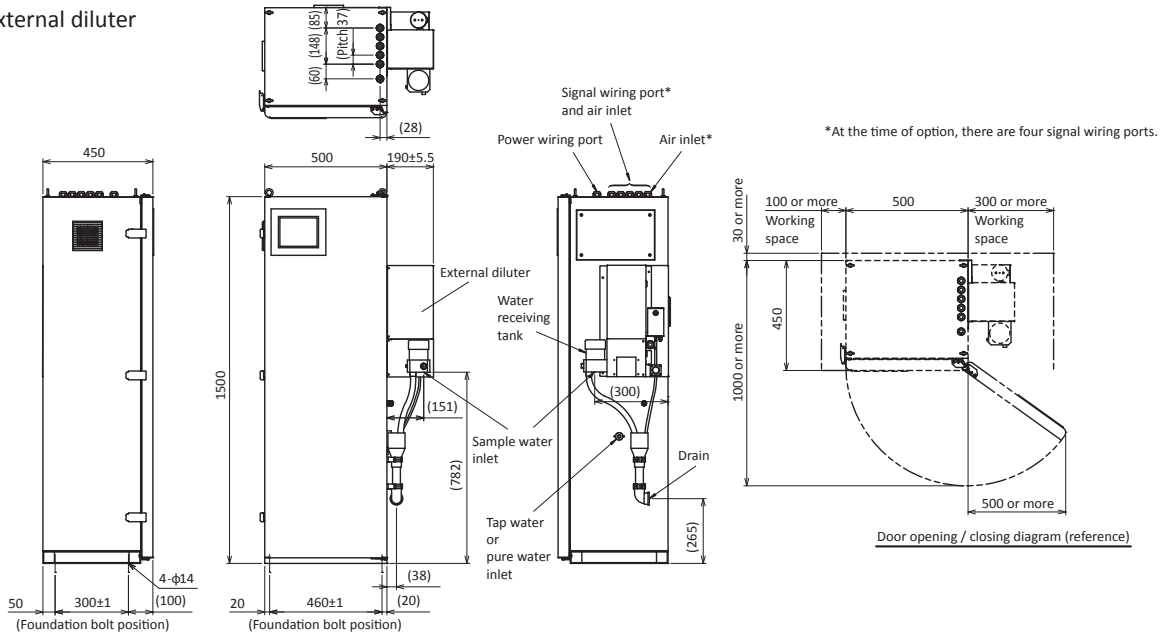
\*2 The even-numbered terminals for command signal input are connected inside the circuit.

**Dimensions**

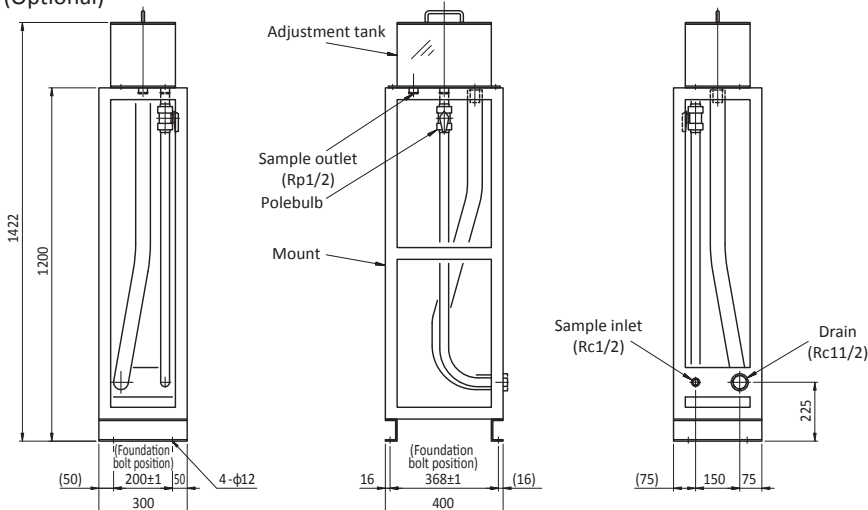
Unit : mm



● With external diluter



● Adjustment tank (Optional)



**Product code**

NPW400-3-□□□□□□□□□□

		Power *1
A		AC 100V 50/60Hz
B		AC 110V 50/60Hz
C		AC 220V 50/60Hz
		Communication function
0		None (standard)
1		RS-485 addition (MODBUS spec) *2
2		RS-232C addition *2
		Total nitrogen measurement range mgN/L *3
O		Measurement not required <sup>Note 3</sup>
		0 to 2
B		0 to 5
C		0 to 10
D		0 to 15
E		0 to 20
F		0 to 25
G		0 to 50
H		0 to 100
J		0 to 200
Y		Other specifications (within above range)
		Total phosphorus measurement range mgP/L *3
O		Measurement not required <sup>Note 3</sup>
		0 to 0.5
B		0 to 1
C		0 to 2
D		0 to 5
E		0 to 10
F		0 to 20
Y		Other specifications (within above range)
		COD measurement range mgO/L (Estimated value) *4
O		Measurement not required <sup>Note 4</sup>
A		0 to 10
B		0 to 20
C		0 to 40
D		0 to 50
E		0 to 100
F		0 to 200
G		0 to 500
Y		Other specifications
		COD (UV) measurement method
0		Measurement not required <sup>Note 4</sup>
1		Internal intermittent measurement (standard)
		Pure water supply method
0		Pure water tank built-in (standard)
1		Built-in deionizer
2		Separate deionizer (order separately) *5 <sup>Note 2</sup>
3		External pure water supply *5
		Chassis air purge *6
0		None (standard)
1		Equipped
		Printer
0		None (standard)
1		Equipped: With automatic roll media take-up device
2		Equipped: Included with mobile printer
		USB memory
A		None (standard)
B		Equipped
		Adjustment tank *7
0		None
1		Equipped
		External dilution device *8
0		None (standard)
1		Equipped
		Door locking mechanism
0		None (standard)
1		Equipped *9
		Description form
0		Japanese (standard) <sup>Note 6</sup>
1		English

Custom spec. code;  
Numeric digit: 9  
Alphabet: Z

\*1. If the power voltage is not AC100V, step-down trans (optional) will be built in  
 \*2. If RS-485, RS-232C is added, the specification must be checked.  
 \*3. Make sure that the measurement range specification for total nitrogen and total phosphorus is measurable in the "Measurement range table by cell length".  
 \*4. An absorbance range, which can be measured by the COD measurement, is determined by a cell length corresponding to a selected TN/TP measurement range. The absorbances that can be measured in a 20-mm cell are 0 to 1Abs, and those in a 5-mm and 10-mm cell are 0 to 2Abs. The COD measurement range is a reference value.  
 \*5. Both pure water supply methods has the function that store the water in the built-in pure water tank after eliminating the wastewater.  
 \*6. If the sample water contains corrosive components such as residual chlorine, sulfur, or hydrogen sulfide, it is recommended for the protection of the instrument. The supplied air should be instrumented air (dedusted and dehumidified air), and the pressure should be set to 0.1MPa with the pressure reducing valve. The volume of air used is approximately 3.5NL.  
 \*7. If there is too many air bubble in the sample water or if the flow fluctuation is rapid, equalizing tank (separate placement) on the former step of the water receiving tank is required  
 \*8. In the case of an external diluent, pure water will be used in large quantities. Place the purified water separately or select pure water from the outside. When the internal dilution is 10 times and the external dilution is 10 times, it is necessary to replenish pure water in about 3 days with the built-in pure water

tank, and to replace the cartridge in about 1.5 months with the built-in pure water tank.  
 Both pure water supply methods has the function that store the water in the built-in pure water tank after eliminating the wastewater.  
 \*9. The key that can be used for the locking mechanism is a padlock with an axis diameter of 5mm or less.

Note  
 1. With a built-in pure water tank, continuous measurement is possible for approximately 7 days.  
 2. The water purifier must be ordered separately.  
 3. When the measurement range of total nitrogen or total phosphorus is specified as "Measurement not required", the basic range(without dilution) will be shipped for adjustment. (Not listed in the inspection report)  
 4. When the measurement range of COD (measurement by UV) is specified as "Measurement not required," 0 to 1Abs (0 to 20mg/L) will be shipped for adjustment (Not listed in the inspection report)  
 5. When an arrester is applied to the power supply and transmission line, it must be specified separately.  
 6. When Japanese text is specified in the form of notation, the operation panel becomes the specified language, but all prints on the printer will be in English.  
 7. DC4 to 20mA (6ch: TN, TP, COD readings and loadings) is the standard transmission output.

**Measurement range table by cell length**

<10mmcell> Measurement range selection at cell length of 10mm (standard)

Measurement range		Total nitrogen (TN [mg/L])								
		0 to 2	0 to 5	0 to 10	0 to 15	0 to 20	0 to 25	0 to 50	0 to 100	0 to 200
Total phosphorus TP [mg/L]	0 to 0.5							Not available	Not available	Not available
	0 to 1	Compatible with 20mm cell						Not available	Not available	Not available
	0 to 2		○	○	○	○	○	○	Not available	Not available
	0 to 5		○	○	○	○	○	○		
	0 to 10		○	○	○	○	○	○	Compatible with 5mm cell	
	0 to 20	Not available	○	○	○	○	○	○		

<20mmcell> Measurement range selection at cell length of 20mm (for low concentration)

Measurement range		Total nitrogen (TN [mg/L])								
		0 to 2	0 to 5	0 to 10	0 to 15	0 to 20	0 to 25	0 to 50	0 to 100	0 to 200
Total phosphorus TP [mg/L]	0 to 0.5	○	○	○	○	○	○	Not available	Not available	Not available
	0 to 1	○	○	○	○	○	○	Not available	Not available	Not available
	0 to 2	○							Not available	Not available
	0 to 5	○							Compatible with 5mm cell	
	0 to 10	○	Compatible with 10mm cell							
	0 to 20	Not available								

<5mmcell> Measurement range selection at a cell length of 5mm (for high concentration)

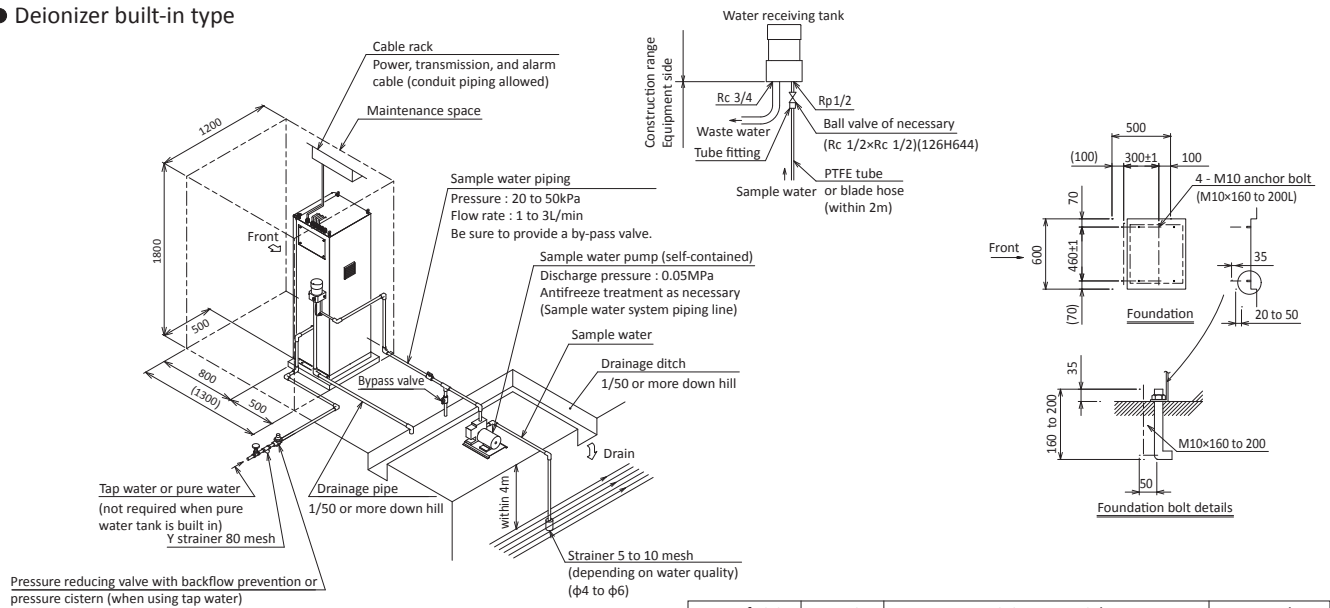
Measurement range		Total nitrogen (TN [mg/L])									
		0 to 2	0 to 5	0 to 10	0 to 15	0 to 20	0 to 25	0 to 50	0 to 100	0 to 200	
Total phosphorus TP [mg/L]	0 to 0.5							Not available	Not available	Not available	
	0 to 1		Compatible with 20mm cell						□	Not available	Not available
	0 to 2								□	□	
	0 to 5								○	○	
	0 to 10		Compatible with 10mm cell							○	○
	0 to 20	Not available							○	○	

□: If you are interested, please contact our sales staff.



## Installation procedure

### ● Deionizer built-in type

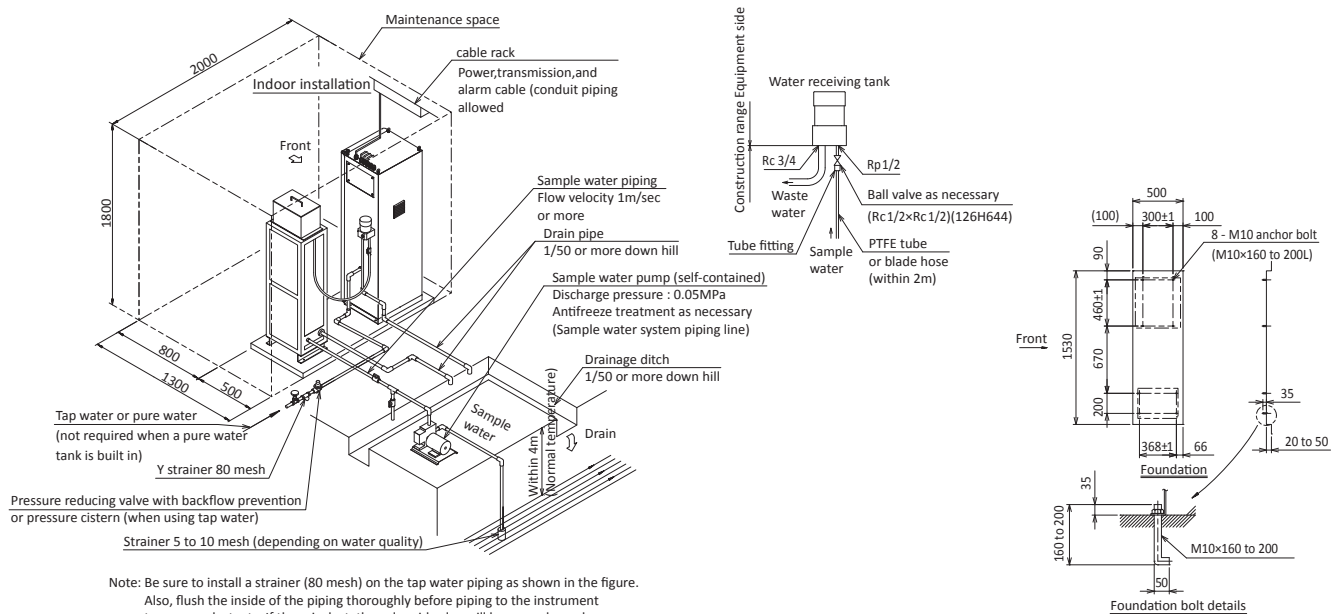


Note: Be sure to install a strainer (80 mesh) on the tap water piping as shown in the figure. Iso, flush the inside of the piping thoroughly before piping to the instrument to remove dust, etc. If there is dust, the solenoid valve will become clogged.

Name of piping	Port size	Piping material	Remarks
Sample inlet	Rp 1/2	PTFE tubing, blade hose, etc. (O.D. φ6 to 10mm)	
Drain outlet	Rc 3/4	Hard PVC tubes (VP20 or higher)	Atmospheric (pipe end)
Tap water inlet	Rc 1/2	Hard PVC tubes (VP13 or higher)	Option
Pure water inlet	Rc 1/2	Hard PVC tubes (VP13 or higher)	Option

NOTE. Before piping to the instrument, flush the inside of the piping thoroughly to remove dust, etc. If there is dust, the solenoid valve will clog.

### ● With adjustment tank



Note: Be sure to install a strainer (80 mesh) on the tap water piping as shown in the figure. Also, flush the inside of the piping thoroughly before piping to the instrument to remove dust, etc. If there is dust, the solenoid valve will become clogged.



## DKK-TOA CORPORATION

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## CAUTION

Please read the operation manual carefully  
before using products.

<https://www.toadkk.com/english/>

Information and specifications are subject to change without notice.