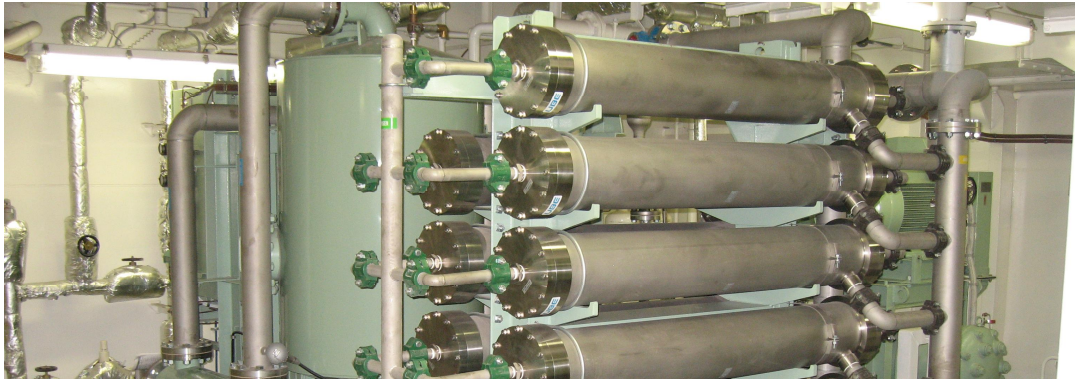


## Membrane Nitrogen Generator System



## PSA Nitrogen Generator System



Our fire-fighting and fire prevention systems are essential for ensuring safety and protecting the life of the crew on board and property on your ships. These systems definitely require regular and proper maintenance to ensure their reliable operation in case of emergency. However, increasing troubles on the systems recently reported to us suggest that they are not always properly maintained. This document is to remind you of the typical consequences the lack of maintenance could have and of the importance of maintenance to keep the system sound and operable.

The negligence of the maintenance could lead to the failure of the system operation when needed and pose considerable risks to human life or property. Since these systems serve as the last resort for safety protection, you are kindly requested to review the maintenance arrangement to ensure their reliable operation.

## Inspection/Maintenance Conducted by Uncertified Agencies

Uncertified agencies do not necessarily fully understand the fundamental structure and functions of the system, and sometimes omit electrical functional tests. Some reported malfunctions are caused by their unauthorized access to and improper modification of the program. In addition, replacing consumables is out of the scope of their service in most cases. Their failure to detect and identify signs and symptoms for a malfunction could lead to serious consequences, including activation failure of the system.

The system requires the use of genuine components and regular maintenance for its proper operation.

## Periodic Check of the Filters

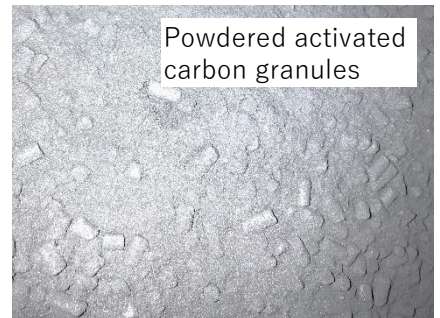
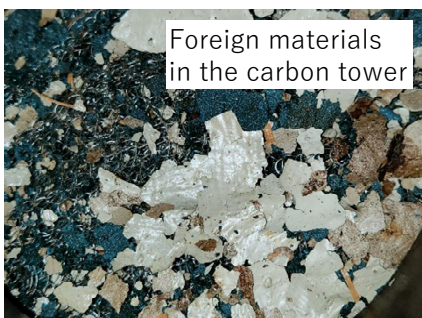
The filters are essential components to maintain the quality of the generate gas and to ensure that the system gives its intended performance. They need to be replaced at the intervals specified in the instruction manual and whenever deterioration is found on them or the differential pressure reaches the specified level for replacement.



If the deteriorated filters are continuously used, pieces of crumbled spongy elements in them could be carried to the activated carbon tower in the downstream. In the worst case, the fragmented pieces reach and damage the adsorption materials for PSA or the membrane modules, which could degrade the performance and cost you a lot for repairing.

## Degradation of the Activated Carbon Granules in the Carbon Tower

The carbon tower is to remove compressor-derived oil content. The bleached or powdered activated carbon granules need to be replaced. The powdered granules, if drawn into the system, damage the adsorption materials for PSA or the membrane modules, which could degrade the performance and cost you a lot for repairing.



## Drainage of Condensed Water

The compressed nitrogen gas contains condensed water which is normally automatically drained out. But a malfunction of the drainage system or clogging in the drainage piping could prevent it and result in the condensed water's flowing into the components in the downstream, such as the carbon tower for the pretreatment, adsorption materials for PSA, or membrane modules, which could degrade the performance and cost you a lot for repairing. Please regularly check the drainage system for its condition.



## Inspection Performed by Certified Agencies

Our on-board inspection program performed by our certified agencies includes checking the filters for their condition and performing the running test as a part of the operation check of the whole system. For details, please refer to the attached document.

## Updating and Replacement of PLCs

The PLCs have 10 years of its design service life according to the manufacturer (OMRON). The systems exceeding 10 years from the ship's delivery are increasingly likely to have troubles with the PLCs. The earlier model (C200H) has already been discontinued and its backup stock and the after-sales service by the manufacturer are no longer available. If this applies to the system on your ship, it is strongly recommended to either update them to the current PLCs or replace them with the alternative as necessary. This process takes some time for the procurement as well as related tasks such as program transformation. You are therefore kindly requested to contact us for this well in advance if needed.



PLC (discontinued model)



PLC (compatible model)

## Regular Replacement of Power Supply Unit

The AC/DC converter (power supply unit) in the main control panel has its design service life ranging from 5 to 10 years depending on its usage environment. Its regular replacement is recommended.



Power supply unit

## Purification of Instrumentation Air

The instrumentation air supplied to the system should be dry and free from oil content. But cases reported to us from some vessels in service show that the instrumentation air entrains a considerable amount of compressor-derived oil mist. To prevent oil contamination, the compressed air must be of Purity Class 3 or cleaner according to the standards set in ISO 8573-1 for the system to properly function.

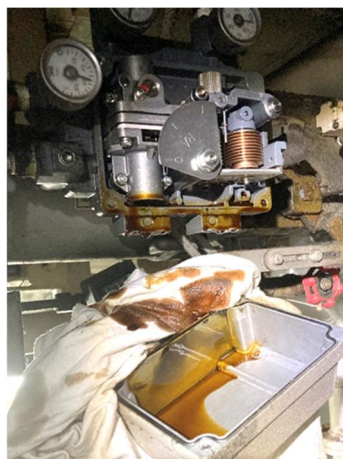
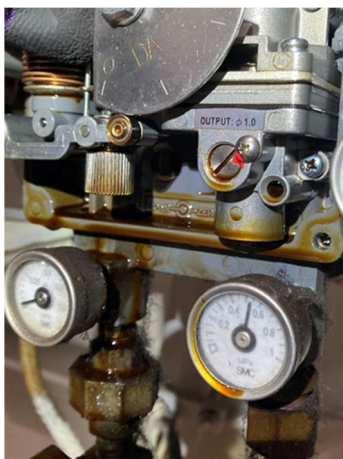


Pressure regulator



Contaminated air

The instrumentation air contaminated with the oil mist has a negative impact on the pneumatic actuator of the automatic valves, or instrumentation devices and oxygen analyzer, and worse than that, may require overhauling or replacing all the affected equipment. The purity of the instrumentation air therefore needs to be constantly attended to.



Valve positioner

## Inspection and Maintenance

We have certified engineers who are fully qualified to inspect and service our inert gas systems to make sure of their reliable operation. Please feel free to contact us for the inspection and maintenance.

For request for quotation or order placement, please contact our service department at [sales@kashiwa-tech.co.jp](mailto:sales@kashiwa-tech.co.jp) including necessary information such as the system name, your ship's name, and IMO No.

## CHECK SHEET to consider replacing the equipment or parts

This is to recommend timing to consider replacing of the equipment or parts, not mandatory.

The item checked in the box is recommended to replace or keep spare, and the item shown as urgent or important is strongly recommend to replace.

If you have any clarification please feel free to contact us.

**SYSTEM :**  
**N2G SYSTEM**

No.	Check off if "Yes"	ITEM	LOCATION	CHECK POINT	ACTION	Remarks	Urgency or importance
1		Air filter element	N2 ROOM AIR TREATMENT UNIT	Differential Pressure	Differential pressure of the filter exceeded higher than 0.07MPa.	Maker recommendation is to replace every year.	Important
2		Air compressor	N2 ROOM	Consumables	Refer to the instruction manual of Compressor.		Important
3		Active carbon (Active carbon tower)	N2 ROOM AIR TREATMENT UNIT	Consumables	Replace all active carbon every 3000 hrs operation or 5 years which ever come earlier.		Important
4		PLC	CONTROL PANEL	MODEL : C200H (Discontinued Model)	Recommend to replace with compatible model since no support from OMRON and no new product is available.	Attachment 1	Very urgent
5		PLC	CONTROL PANEL	AGE : More than 10 years	Recommend to replace as design service life of the PLC is 10 years which is announced by OMRON.	Attachment 2	Very urgent
6		AC/DC CONVERTER (Power supply)	CONTROL PANEL	AGE : More than 7-10 years	Recommend to replace as design service life of the Power supply is 5 years which is announced by OMRON.	Attachment 3	Very urgent
7		Press. Controller	CONTROL PANEL	AGE : More than 10 years	Recommend to have a spare.	Maker recommendation	
8		I/P Converter	CONTROL PANEL	AGE : More than 5 years	Recommend to have a spare.	Maker recommendation	
9		Oxygen analyzer (Sensor)	ENGINE ROOM	Deterioration or AGE : More than 5 years	Recommend to have a spare unless redundancy analyzer is placed as the sensor deteriorates in approx. 3 to 5 years in average .		Urgent
10		Oxygen analyzer (Receiver and cable)	ENGINE ROOM	AGE : More than 10 years	Recommend to have a spare.	Maker recommendation	
11		Oxygen analyzer (Sample filter)	ENGINE ROOM	Dirt check	Recommend to replace.		
12		Filter regulator for instrument air (Filter element)	ENGINE ROOM	Dirt check	Recommend to replace.		
13		Control Valves (Positioner)	ENGINE ROOM (IG MAIN LINE)	Function	If malfunction is observed, clean the positioner and check the instrument air condition or replace it.	There are several expected cause, so contact us for recovery if it has not recovered.	
14		Pressure switch	PUMP ROOM ENTRANCE	Deterioration or salt damage	Check the function and open the cover to check no salt damage. Recommend to have a spare.	Maker recommendation	

*Kashiwa Tech Co., Ltd.*

● Contact information

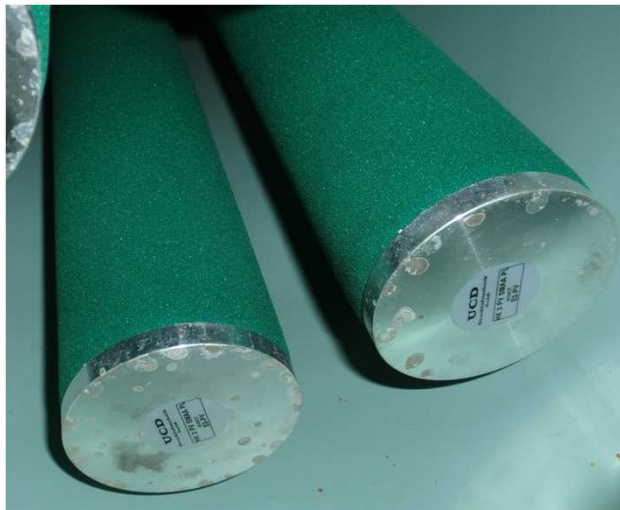
KASHIWA TECH CO., LTD. (Tokyo Headquarters)  
5-4 Takanawa, 4-Chome Minato-ku, Tokyo 108-0074, JAPAN  
Sales department  
TEL : +81-3-5449-2431  
FAX: +81-3-5449-2430  
E-mail: sales@kashiwa-tech.co.jp

# KASHIWA N2 GENERATOR SYSTEM – MEMBRANE TYPE

## Information about consumables, tools and upgraded components

### Filter Element (FLT1/2/3)

The filters remove oil and water contained in the supplied compressed air and require regular replacement of their element, the negligence of which could degrade the performance of the membrane unit.



\* It is best to replace the element once a year.

### PLC Replacement Kit

Do you find in the control panel any PLCs that are already discontinued (e.g. Omron C200HE) or more than 10 years old?

Due to **the** limited availability, we recommend you **replacing** them with the latest **model** at the earliest possible opportunity to avoid an extended period of the system's inoperability.



We provide an easy-to-replace kit arranged by the PLC manufacturer with the corrected drawings of the system and detailed replacement procedure.

\* We keep the full record of the system for its maintenance and modification and keep track of the replacement parts ordered after the ship went into service. Contact us for ordering the replacement parts.

### MEMBRANE UNIT

If the performance of the N2 system deteriorates, the membrane unit needs to be replaced. When replacing membranes, our service engineer must perform balancing work on each membrane. Otherwise they do not perform proper capacity and purity.



\* Once a membrane's performance has deteriorated, it cannot be reused.

\* Please replace the filter element regularly as per the instruction to avoid foreign material.

### Positioner for Control Valves

N2 main valve and exhaust valve are equipped with a positioner to control its opening.

The valves would not properly open or close if the positioner malfunctions, leading to failure of maintaining a proper pressure to supply the **nitrogen** gas to the cargo tanks.



\* The positioners of 10 years old are recommended to be replaced.

### General Inspection

Our authorized service agencies are ready to serve you for the inspection of our systems. They are closely working with Kashiwa Tech for the reliable operation of the systems. Please feel free to contact us when you need the information about the nearest agency.

Please contact our service department at [sales@kashiwa-tech.co.jp](mailto:sales@kashiwa-tech.co.jp) for request for quotation or order placement with such information as the system's name, ship's name and IMO number.

*Kashiwa Tech Co., Ltd.*

# KASHIWA N2 GENERATOR SYSTEM – PSA TYPE

## Information about consumables, tools and upgraded components

### Filter Element (STR1/2)

The N2 Generator PSA type incorporates 2 filters: STR1 on the compressor outlet, and STR2 on the N2 gas outlet.

These filters require regular replacement of the element to maintain their performance.



\* It is best to replace the element once a year.

### PLC Replacement Kit

Do you find in the control panel any PLCs that are already discontinued (e.g., Omron C200HE) or more than 10 years old?

Due to the limited availability, we recommend you replacing them with the latest model at the earliest possible opportunity to avoid an extended period of the system's inoperability.



We provide an easy-to-replace kit arranged by the PLC manufacturer with the corrected drawings of the system and detailed replacement procedure.

\* We keep the full record of the system for its maintenance and modification and keep track of the replacement parts ordered after the ship went into service. Contact us for ordering the replacement parts.

### Positioner for Control Valves

N2 main valve and exhaust valve are equipped with a positioner to control its opening.

The valves would not properly open or close if the positioner malfunctions, resulting in failure of maintaining a proper pressure to deliver the nitrogen gas to the cargo tanks.



\* The positioners of 10 years old are recommended to be replaced.

### I/P CONVERTOR

I/P converter is the component to send the opening/closing signal to the N2 main valve and exhaust valve.

The valves would not properly open or close if the converter malfunctions, leading to failure of maintaining a proper pressure to deliver the nitrogen gas to the cargo tanks.



\* The newly-adopted converter since 2022 has compatibility and is interchangeable with the existing one.

### General Inspection

Our authorized service agencies are ready to serve you for the inspection of our systems. They are closely working with Kashiwa Tech for the reliable operation of the systems. Please feel free to contact us when you need the information about the nearest agency.

Please contact our service department at [sales@kashiwa-tech.co.jp](mailto:sales@kashiwa-tech.co.jp) for request for quotation or order placement with such information as the system's name, ship's name and IMO number.

*Kashiwa Tech Co., Ltd.*

**Product Discontinuation  
Notices**

Programmable Controllers, Networks

Issue Date  
January 6 2016

No. 2016007CE

**Discontinuation Notice of Programmable Controllers C200HX/HE/HE series  
and a part of C200H I/O and special I/O units.****Product Discontinuation**

Programmable Controllers

**Part of C200HX/C200HG/C200HE  
series****Model C200PC-ISA[ ]3(-[ ][ ][ ](-E))  
Model C200PC-EXP01  
Model 3G2NL-DRM21, -CPU02  
Model 3G2NL-CLK[ ]****Recommended Replacement**

Programmable Controllers

**Model CS1 or CJ2 series****Model CS1 or CJ2 series  
No recommended replacement  
Model 3G2NJ-CPU11  
Model 3G2NJ-CLK21**

Networks

**Model C200H-B7A[ ]  
Model C200HW-DRT21, -DRM21-V1,  
-SRM21-V1, -CORT21**

Networks

**Model CS1 or CJ2 series  
Model CS1 or CJ2 series****[ Discontinuation date ]**

The end of March, 2017

**[ Caution on recommended replacement ]**

C200HX/HG/HE series CPU units and a part of I/O and special I/O units will be discontinued.

Replacement of PLCs will require design change works  
(PLC Programming, unit setting, wiring and so on).**[ Difference from discontinued product ]**

Recommended replacement Model	Body Color	Dimensions	Wire connection	Mounting Dimensions	Characteristics	Operation ratings	Operation methods
CS1 series	*	*	--	*	--	--	--
CJ2 series	--	--	--	--	--	--	--

\*\* : Compatible

\* : The change is a little/Almost compatible

- : Not compatible

- : No corresponding specification

## Preventive Maintenance for Programmable Controllers

Date: 12 Jun. 2012

### 1. Introduction

The Programmable Controllers (PLC) that serve as the core of various control systems are composed of a large number of components. These components cannot be used indefinitely, and must be replaced when they have reached the end of their useful life. If a PLC should malfunction, considerable time is required to restore system operation and losses occur while the operation is stopped. To prevent PLC failures from occurring, we suggest that you consider a preventive maintenance program. Malfunctions can be prevented by replacing specific components shortly before wear-out failures (see section 2) begin to occur.

However, because there is also a possibility of early or random failures, we also recommend that you consider preparing spare parts to use as an emergency measure.

### 2. Useful Life (Years of Use vs. Malfunction Occurrence)

Component failures can ordinarily be classified into the three stages of early failures, random failures, and wear-out failures, as shown in the diagram below.

Early failure period:

This refers to defects, such as defective components or manufacturing problems that are discovered soon after the product is first used. We attempt to eliminate these failures by means of shipping inspections and other measures.

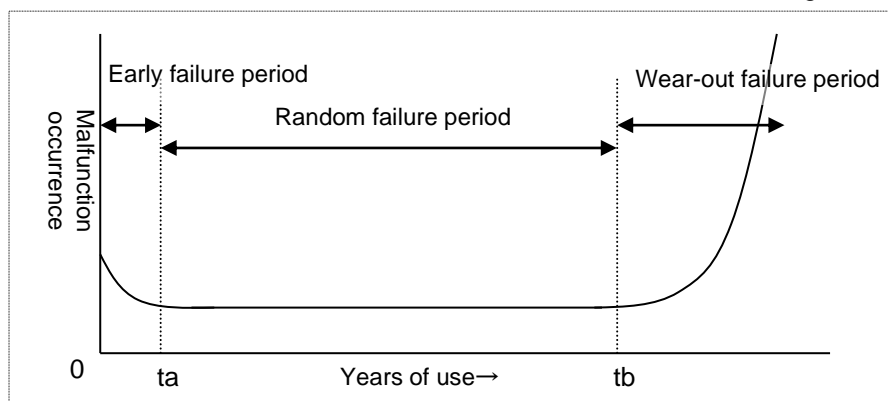
Random failure period:

This refers to failures that occur within the useful life of the equipment. They are called random failures because they occur suddenly and cannot be predicted.

Wear-out failure period:

Wear-out failures occur near the end of the useful life due to deterioration or wear. Because of this, their occurrence increases rapidly as time passes. The start of this period is indicated by  $t_a$  in Fig. 1, while  $t_b$  differs for each PLC and Unit. Our views on the useful life of PLC are given in section 3.

Fig. 1



### 3. PLC Lifetime

Some of the components used in the PLC have lifetimes of less than 10 years, depending on the environment in which the PLC is installed and the model of the PLC. These include batteries for memory back-up, output relays, fuses, photo couplers, and aluminum electrolytic capacitors. The lifetime of some Units is determined by these components. Lifetime calculations and design are employed based on the standard of a useful life of 10 years for PLC (compared with the former standard of 7 years).

### 4. Preventive Maintenance Time Guidelines (Recommended Replacement Times)

The following recommended replacement times (the equivalent of  $t_b$  in Fig. 1) are guidelines for replacing the indicated items. For further details, please inquire and provide specific model numbers.

(Time relationship = Preventive maintenance time (recommended replacement time) < Design lifetime < Actual lifetime)

Unit Name		Recommended Replacement Time	Design Lifetime
Power Supply	C(C200H)/CV Series CS (C200H $\alpha$ ) (Manufactured in or before Oct. 2000)	5 years	7 years (operated at 30°C, 24 h/day) (Load rate 70%)
	CS (C200H $\alpha$ ), CJ Series (Manufactured in or after Nov. 2000) CP Series	8 years	10 years (operated at 40°C, 24 h/day) (Load rate 70%)
	C/CV Series (See Note 1.)	7 years	7 years (operated at 30°C, 24 h/day)
CPU	CS, CJ,CP Series	10 years	10 years (operated at 40°C, 24 h/day)
	Backplane, I/O Unit (See Note 2.)	10 years	10 years (operated at 40°C, 24 h/day)
Special I/O Unit, CPU Bus Unit	C/CV Series, DRT1 Series DRT2 Series(Manufactured before Jun. 2004) SRT1, SRT2 Series	7 years	7 years (operated at 30°C, 24 h/day)
	CS, CJ,CP Series GX Series CRT1 Series DRT2 Series(Manufactured in or after Jun. 2004)	10 years	10 years (operated at 40°C, 24 h/day)

Note 1: Because the power supply is built-in to the C200H-CPU\*\* and C200HS-CPU\*\*, replacement/repair is recommended at 5 years.

Note 2: Except for relay contact output types. (See section 6, item 2 for information on relay contact output types.)

## 5. Spare Parts

### 1) Preparing spare parts

We recommend that you prepare spare parts in advance in order to shorten the amount of system downtime due to a PLC failure. Provide spare parts that match the PLC configuration that you are using.

### 2) Processing spare parts

#### (1) Storage conditions

The storage life of components is related to temperature and humidity (the lower these are the better). Store spare parts at a room temperature of 5 to 35°C (20 to 30°C recommended), with normal humidity of 30 to 80% (40 to 60% recommended), in a place that is not subject to direct sunlight. Do not store spare parts in places subject to the following conditions:

- Condensation
- Atmospheres with toxic gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.), so as to prevent the components from oxidizing
- Ozone, radiation, ultraviolet radiation
- Vibrations or impacts

#### (2) Unit storage period

When storing spare parts (units) for extended periods, it is recommended that you apply current to them for approximately 30 minutes periodically (about once every three years), to maintain the function of the aluminum electrolytic capacitors (applying current to maintain the electrolyte) and check their operation. The storage limit must be periodically checked and controlled to ensure a storage limit of about 10 years (see note 1) because these units are equipped with aluminum electrolytic capacitors.

Note 1: The 10-year limit is a guideline that was determined by considering the static lifetime of aluminum electrolytic capacitors (approx. 15 years) and their operating period as spare parts.

(See the detailed explanation in item 6.)

#### (3) Storage period for memory back-up batteries

Store batteries separately, not mounted in the PLC. The storage period for batteries is two years, and this storage limit must be periodically checked and controlled.

(See the detailed explanation in item 6.)

## 6. Detailed Explanations

### 1) Memory back-up batteries

Back-up batteries are used for memory (RAM) back-up mainly in CPU Units. Refer to the operating instructions for each CPU to determine the capacity lifetime of the battery (the lifetime due to capacity reduction) because it varies depending on the CPU model, operating rate (the power ON rate), and the usage conditions (temperature).

In addition to the remaining capacity of the battery, there is also a danger of electrolyte leakage caused by deteriorated seals after many years of use. For this reason, all batteries should be replaced within five years. The static design lifetime of batteries is seven years.

When batteries are used past their lifetime, the possibility of electrolyte leakage becomes extremely high. Electrolyte is highly corrosive, and it is also electrically conductive, so there is a risk that it will corrode other parts around it and also generate smoke and odors. For these reasons, careful attention must be paid to the battery lifetime.

### 2) Output relays

The lifetime of I/O Units that use relay contact outputs is determined by the lifetime of the outputs. The relay lifetime depends greatly on the contact current, the ambient temperature, and the nature of the load (resistance load, inductance load, etc.). Decide on the timing for preventive maintenance from the relay life-test curve and number of operations listed in the I/O Unit operation manual.

### 3) Photo couplers

Photo couplers are used to isolate the I/O Units, Communications Units, and other PLC Units from the other equipment in the system. The LED that is built into the photo coupler has a lifetime, and the brightness of the LED lowers with usage until, at the end of its lifetime, the signal can no longer be transmitted.

The lifetime varies depending on the ambient temperature and illumination time, but because the photo coupler lifetime is longer than that of the aluminum electrolytic capacitors, the Unit lifetime is determined by the aluminum electrolytic capacitors.

### 4) Aluminum electrolytic capacitors

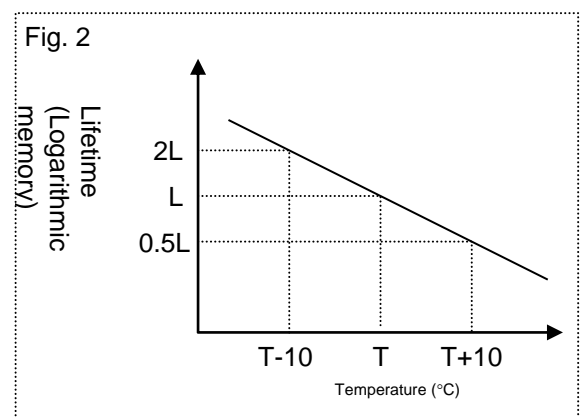
#### (1) Aluminum electrolytic capacitor lifetime

Due to the component structure, the capacity reduction (performance drop) and lifetime of aluminum electrolytic capacitors is caused by its internal electrolyte gradually leaking out of the lower rubber seals. As shown in Fig. 2, the lifetime has a coefficient of correlation with the usage temperature.

According to the Arrhenius equation (the doubling 10°C rule), the lifetime is reduced 1/2 with each 10°C rise in ambient temperature, and is doubled with each 10°C drop in ambient temperature.

The static lifetime of the aluminum electrolytic capacitor is about 15 years (due to deterioration of the electrolyte rubber seal). Therefore, the aluminum electrolytic capacitor lifetime is defined as the shorter of these two lifetimes, i.e., the lifetime calculated by the Arrhenius equation and the static design lifetime. If the aluminum electrolytic capacitor is used past its lifetime, there is an extremely high possibility that electrolyte will leak out.

Electrolyte is highly corrosive, and it is also electrically conductive, so there is a risk that it will corrode other parts around it and also generate smoke and odors. For these reasons, careful attention must be paid to the lifetime of aluminum electrolytic capacitors.



## (2) Power supply lifetime

- The lifetime of the power supply is determined by calculating the lifetime of the aluminum electrolytic capacitor. Basically, the design lifetime is as follows.

C/CV Series: 7 years (operated 24 h/day at 30°C, with a load rate of 70% (see note 1))

CS1 Series: 10 years (operated 24 h/day at 40°C, with a load rate of 70% (see note 1))

Note 1: Load rate = Sum of current consumed by system Units / Max. Power supply x 100

## 2. Relationship among ambient temperature, load rate, and lifetime

Because a rise in the load rate also causes a rise in the heat generated by the power supply, the aluminum electrolytic capacitor temperature is affected by the sum of the ambient temperature and the heat generated by the power supply.

Fig. 3 shows a typical sample of the change in lifetime according to changes in the ambient temperature and load rate. (Fig. 3 is a typical sample (C500-PA221) calculated from actual measurement values, and is not to be interpreted as assuring a certain lifetime.)

Fig. 3

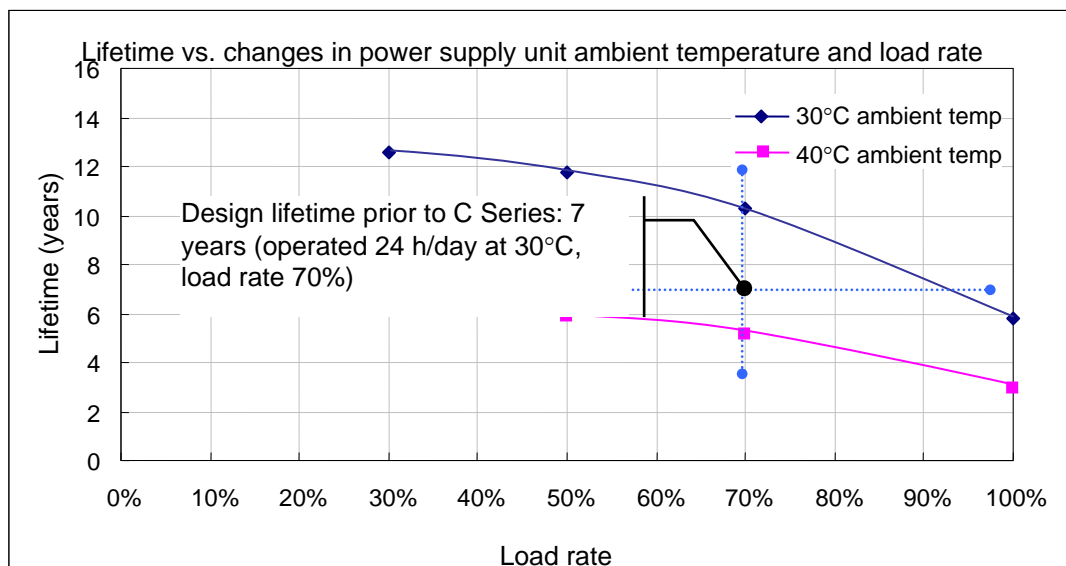
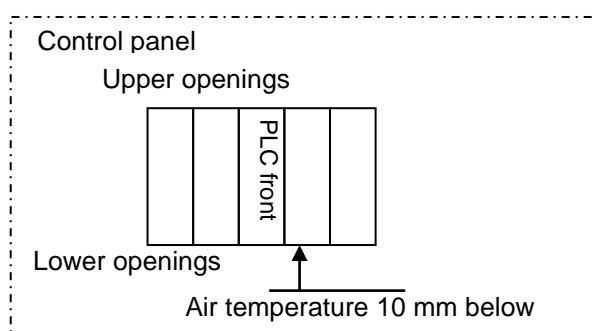


Fig. 4 Ambient temperature measurement reference point: temperature 10 mm below PLC



## (3) CPU, Special I/O Unit (CPU Bus Unit)

The lifetime varies depending on the Unit.

When the Unit has an internal power supply module or uses aluminum electrolyte capacitors as an important functional component, the design lifetime is seven years for the C/CV Series (30°C), and 10 years for the CS/CJ Series or later (40°C).

When aluminum electrolyte capacitors are not used as an important functional component, the design lifetime is ten years.

(4) I/O Unit

Because aluminum electrolyte capacitors are not used as an important functional component, the design lifetime is ten years.

## Period and Terms of Warranty

### Warranty Period

The Power Supply warranty is valid for a period of three years from the date of shipment from the factory.

### Terms of Warranty

The warranty is valid only for the following operating conditions.

1. Average ambient operating temperature of the Power Supply: 40°C max. (See note.)
2. Average load rate of 80% max. (See note.)
3. Mounting method: Standard mounting
4. Rated input voltage

**Note:** The maximum ratings must be within the derating curve.

If the Power Supply fails for reasons attributable to OMRON within the above warranty period, OMRON will repair or replace the faulty part of the Power Supply at the place of purchase or the place where the Power Supply delivered without charge.

This warranty does not cover the following types of failures.

- (1) Failures that result from handling or operation of the Power Supply under conditions or in environments that are not given in this document and not given in any other specifications exchanged between OMRON and the customer
  - (2) Failures that originate in causes other than the delivered product itself
  - (3) Failures caused by disassembly, modification, or repair of the Power Supply by anyone other than OMRON
  - (4) Failures caused by applications or uses for which the Power Supply was not originally intended
  - (5) Failures caused by factors that could not be anticipated with the scientific or technical knowledge available when the Power Supply was shipped
  - (6) Failures caused by other causes for which OMRON is not responsible, such as natural disasters and other acts of God
- This warranty is limited to the individual Power Supply that was delivered and does not cover any secondary, subsequent, or related damages.

## Recommended Replacement Periods and Periodic Replacement for Preventive Maintenance

The recommended replacement period for preventive maintenance is greatly influenced by the application environment of the Power Supply. As a guideline, the recommended replacement period is 7 to 10 years.\*

To prevent failures or accidents that can be caused by using a Power Supply beyond its service life, we recommend that you replace the Power Supply as early as possible within the recommended replacement period.

However, bear in mind that the recommended replacement period is for reference only and does not guarantee the life of the Power Supply.

Many electronic components are used in the Power Supply and the Power Supply depends on the correct operation of these components to achieve the original Power Supply functions and performance.

However, the influence of the ambient temperature on aluminum electrolytic capacitors is large, and the service life is reduced by half for each 10°C rise in temperature (Arrhenius law).

When the capacity reduction life of the electrolytic capacitor is reached, the Power Supply failures or accidents may occur.

We therefore recommend that you replace the Power Supply periodically to minimize product failures or accidents in advance.

\* The recommended replacement period applies under the following conditions: rated input voltage, load rate of 50% max., ambient temperature of 40°C max., and the standard mounting method.

This Power Supply model is designed with a service life of 10 years minimum under the above conditions.