



ANTI ROLLING GYRO

ARG45T OPERATION INSTRUCTIONS

ARG45T 取扱説明書

Model : MSM-4500T-A1

型式 : MSM-4500T-A1

English version : page1 – page37

日本語 : P.38 ~ P.79

MOHMEI

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Preface

This operation instructions summarized important information for proper operation of Anti Rolling Gyro (**ARG**). Please be sure to read this manual before operation.

Please be sure to submit this manual to customers who operate the **ARG**.

Important Notice

■ Purpose and Application of Use

- The **ARG** suppresses rolling motion of the ship.
- The **ARG** applies a principle that the Gyro torque (force) is generated by inclination of the flywheel rotation at high speed.

■ General Information

- In order to safely operate the **ARG**
 - (a) Only the repairmen, who have received the specified training about the **ARG**, are permitted to perform maintenance and inspection other than items mentioned in this manual.
 - (b) Before operation of the **ARG**, carefully read this manual of the **ARG** for comprehending the details. If starting the work with insufficient knowledge, it may cause the **ARG** failure or an accident resulting in injury or death.
 - (c) Do not disassemble and modify the **ARG** by yourself. If the **ARG** is disassembled or modified by the customer,
 - It may cause a decrease in the **ARG** performance.
 - It may endanger human life.
 - It may cause a health problem.
 - It may cause damage to the **ARG** or ship.
 - (d) Please contact the Sales Agent for installation or removal of the **ARG**. If installation or removal of the **ARG** is performed by the customer, it may result in injury and damage to the **ARG** and ship.
- Please observe the applicable governmental and local laws and regulations.
- Tohmei Industries co., Ltd. is not responsible for any damages and losses that happened to the customer except for the first customer who purchased from the Sales Agent.
- Please observe the governmental and local regulations for exportation of the **ARG**.
- Please observe the governmental and local regulations for disposal of the **ARG**.

■ Important Information for Operation Safety

- The most important purpose of safety measures is to prevent the persons from an accident resulting in injury or death as well as to protect the **ARG** and ship from avoidable trouble.
- For preventing injury/death in an accident and the **ARG** from damage, follow the cautions, rules, and instructions described in this manual giving the top priority to safety. If ignored,
 - a) It may endanger human life.
 - b) It may cause a health problem.
 - c) It may cause damage to the **ARG** or ship.
- Tohmei Industries co., Ltd. cannot foresee all possible danger existing in the **ARG**, resulting from human error, and in the environment where the **ARG** is used. There are many “Musts”, “Can’ts” and “Don’ts”, and it is impossible to mention all in this manual or warning labels. Therefore, general safety measures must be taken in addition to the instructions described in this manual.
- Tohmei Industries co., Ltd. is not responsible for any damage and hindrance resulting from customer’s carelessness or lack of required attention to the specified rules shown in this manual.

■ About Operation Instructions

- This operation instructions are written for native readers of English. When this **ARG** is handled by non-English-speaking people, give the people fully training on safety.
- The copyright of this manual is held and reserved by Tohmei Industries co., Ltd. No drawing and no technical description in this manual regardless of partial or whole may be published, reproduced, copied, photographed, translated, or transcribed into electronic medium without written permission of Tohmei Industries co., Ltd. in advance.
- The **ARG** may differ from the pictures and drawings shown in this manual.
- The contents of this manual may be changed without prior notice.
- Carefully keep this manual in a certain place so that anybody can read it as the need arises.
- If there are any questions or doubts, please contact the Sales Agent.
 (“Contact” (last page))



1. For your Safety

1.1 Warning description










■ Description of Labels

“Warning labels” and “Warning descriptions” in this manual warn expected dangerous situation that may occur during operation.

If they are ignored, serious injuries or accidents corresponding to the respective warning sign may result. In extreme case, there is also a possibility of death, damage to the **ARG** or ship, and environmental fracture.

Warnings	Meanings of Warnings
IMPORTANT	Indicates “IMPORTANT” subjects that are observed in handling the ARG . If the ARG is handled with ignoring this indication, it could result in death or serious accident.
 DANGER	Indicates a dangerous situation. If ignored, it could result in death, serious injury, serious property damage or environmental damage.
 CAUTION	Indicates a dangerous situation. If ignored, it could result in minor injury, property damage or environmental damage.

■ Meaning of the symbols

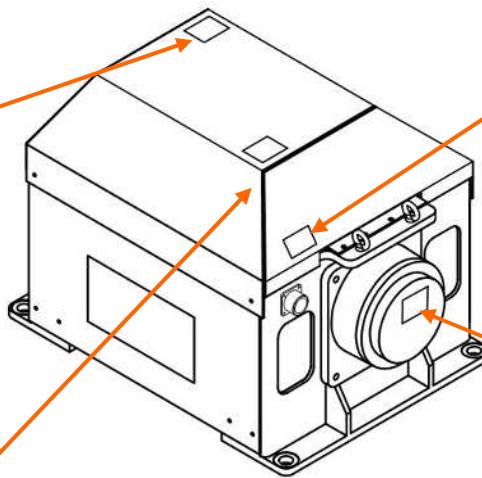
Symbols	Meanings	Examples
 Prohibition sign	“  ” indicates prohibition. Detail is shown in the inside of the symbol, or shown by illustration or sentence near the symbol. The right illustration means “ DO NOT DISASSEMBLE ”.	 (DO NOT DISASSEMBLE)
 Caution sign	“  ” indicates danger or caution. Detail is shown in the inside of the symbol, or shown by illustration or sentence near the symbol. The right illustration means “ DANGER OF ELECTRIC SHOCK ”.	 (DANGER OF ELECTRIC SHOCK)
 Direction sign	“  ” indicates mandatory contents. Detail is shown by illustration, or sentence near the symbol or inside the symbol.	 (General direction)

1.2 Warning labels

Do not disassemble.



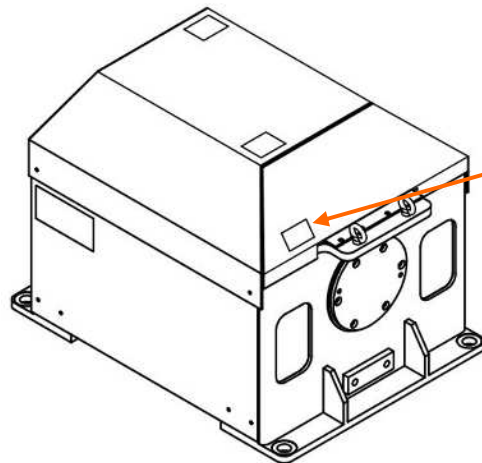
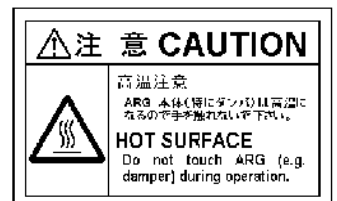
Do not place objects.



Danger of electric shock.



Hot surface

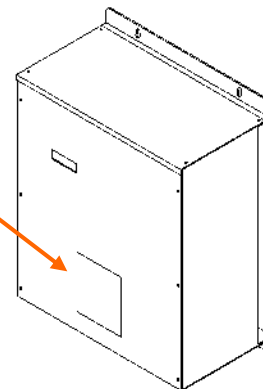


Do not close.



ARG unit

Danger of electric shock.
Do not disassemble.
Do not close.



Motor Driver

1.3 Precautions of Operation

Observe the following when operating.

IMPORTANT



General Precautions

Be sure to read this manual and understand the contents.



Operation Environment

- The **ARG** is only designed to improve the comfort of you and passengers on the ship, and not intended for operation in heavy weather.
- Do not turn it on in heavy weather, doing so could cause heat generated inside Damper and result in damage to the **ARG**.
- Do not quick-turn repeatedly during the **ARG** operation.



Maintenance

- Perform the pre-operational inspection.
- Have the periodic inspection performed by the Sales Agent every two years.
- Contact the Sales Agent for wiring of the **ARG**.

Operational problems

If abnormalities occur during operation, immediately turn off switch to shut down the **ARG**. Contact the Sales Agent. ("Contact" (last page))



Installation

The model, numbers of the **ARG** unit and the Motor Driver are decided for each ship. Never divert the **ARG** unit and the Motor Driver to other ships.



Disposal

Observe the governmental and local regulations for disposal of the **ARG**.

2. Configurations

2.1 ARG unit

Table 2-1 **ARG** unit (1EA)

Item	Specifications	
Name	ARG45T	
Model	MSM-4500T-A1	
Dimensions	445 mm (height) x 715 mm (width) x 475 mm (depth) 17.5 inches (height) x 28.1 inches (width) x 18.7 inches (depth)	
Weight	Approx. 210 kg / 463 lbs	
Power supply	DC 12V(10.5~16V) { SP-1500-212, MAA-25000B-A200 }	
Ambient temperature	-10 to 40°C (The safety device shut down the ARG more than 80°C, and ARG can be used at temperatures below 80°C, including temperature rises.)	
Power consumption *1)	Approx. 0.9 kW (Max) Steady-state : 0.55 kW (Max)	Steady-state : 0.4 kW (Max) *4)
Anti-Rolling Torque	Approx. 4,500 Nm (Max)	Approx. 3,500 Nm (Max) *4)
Angular momentum	Approx. 900 Nms	Approx. 700 Nms *4)
Rotational speed	Approx. 4,900 rpm	Approx. 3,800 rpm *4)
Noise *2)	70 dBA maximum	
Vibration *2)	1 m/s ² maximum	
Performance	<ul style="list-style-type: none"> • The ARG suppresses rolling motion of the ship. • The ARG applies a principle that the Gyro torque (force) is generated by inclination of the flywheel rotating at high speed. • The ARG stops automatically in abnormal conditions (excessive load, abnormal temperature, etc.). 	
Others	Start up duration to the rated speed: Approx. 30 minutes To stop the operation completely from the steady state: Approx. 60 minutes.	

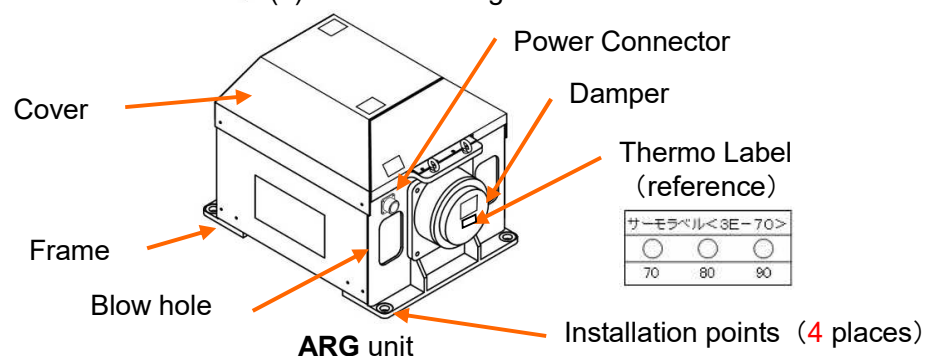
*1) Power consumption varies with the customer generator.

*2) Measurement as per TOHMEI's specification.

The measurements data depend on measurements conditions (installation place, measurements method, etc.).

*3) Please use this condition when storing and transporting.

*4) This specification is when **ARG** is running ECO Mode. Please refer to change the **ARG** to ECO mode. Please refer 4.3.(3) about switching ECO mode.

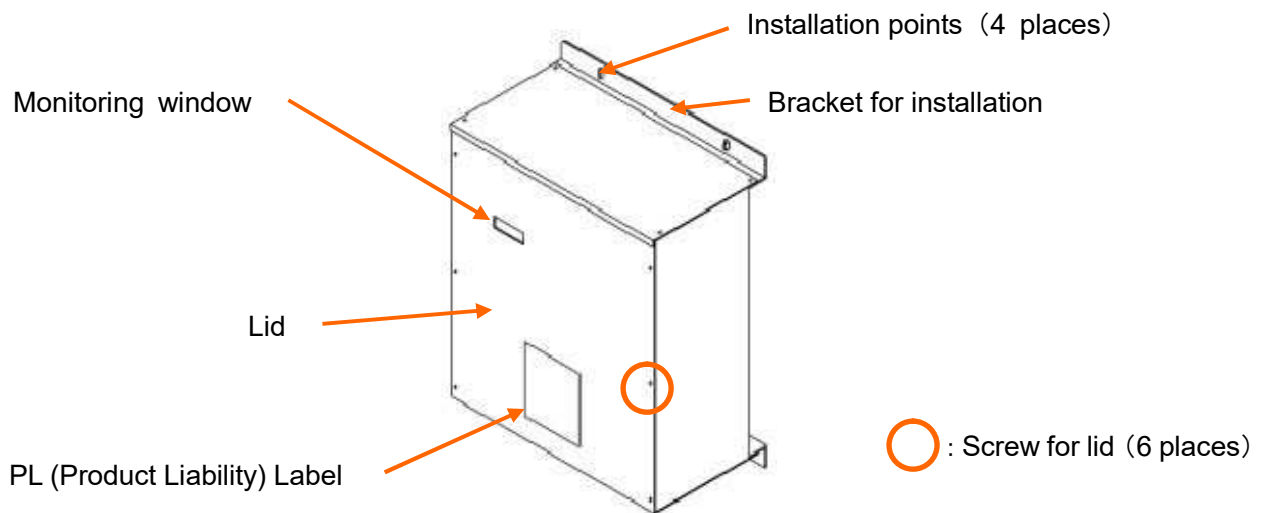


2.2 Motor Driver

Table 2-2 Motor Driver (1EA)

Item	Specifications
Model	MAA-25000B-A200
Dimensions	190 mm (height) x 400 mm (width) x 350 mm (depth) 7.48 inches (height) x 15.7 inches (width) x 13.8 inches (depth)
Weight	Approx. 15 kg / 33.1 lbs
Control method	Inverter control
Ambient temperature	-10 to 40°C *1)
Humidity	5 to 95% (with no condensation) *1)
Short circuit current rating	100 kA
Power supply	Single-phase 210 to 240VAC 50/60Hz Convert the power from the 12V DC battery into AC by the Power Inverter (SP - 1500 - 212).
Options (outer connecting terminal)	The ARG's operating is starting and stopping by Touch Display.
Others	The ARG's operating condition is checked by Monitoring window.

* 1) Please use this condition when storing and transporting.



Motor Driver

2.3 Power Invertor

Table 2-3 Power Invertor (1EA)

Item	Specifications
Model	Sinusoidal Power Invertor
Type	SP-1500-212
Dimensions	83 mm(height) × 248 mm(width) × 421 mm(depth) 3.27 inches(height) x 9.76 inches(width) x 16.6 inches(depth)
Weight	4.14 kg
Ambient temperature	-20 ~ 40°C *1)
Humidity	10 ~ 95% (with no condensation) *1)
Power supply	12VDC(rating)、 10.5~16.5VDC(operable)
Output Voltage	Single-phase 200 to 240V、 50/60Hz
Output Power	1500VA(rating)
Safety Circuit	Over voltage、 low voltage、 reverse connection (internal fuse)、 short circuit, overload, over temperature, low temperature

* 1) Please use this condition when storing and transporting.



Power Invertor

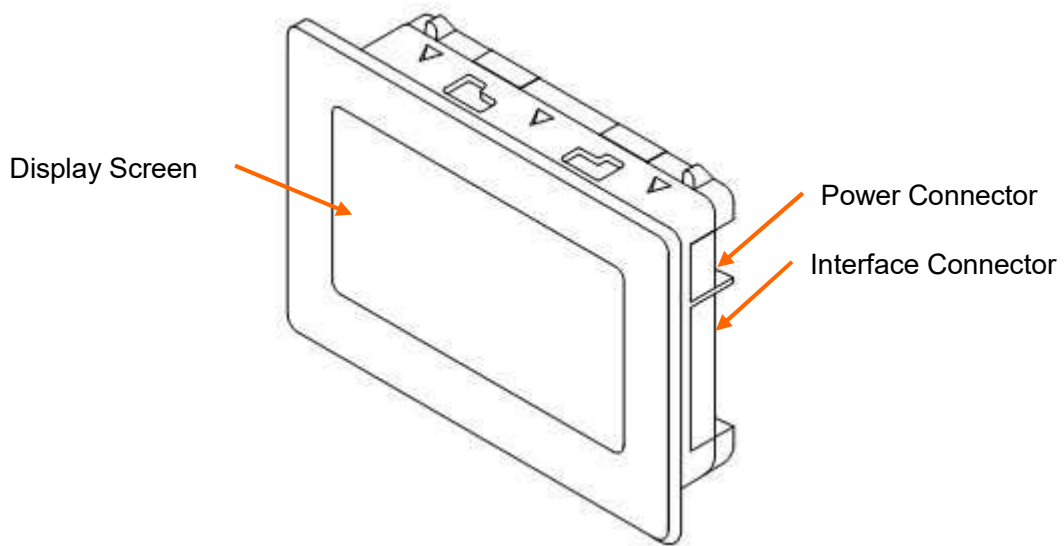
Note: The power inverter is the above-mentioned commercially available or equivalent product of "Denryou" Ltd., handling and others depend on the individual specification of the product.

2.4 Touch Display

Table 2-4 Touch Display (1EA)

Item	Specifications
Name	Touch Display
Model	PFXGP4116T2D
Dimensions	90 mm(height) × 125 mm(width) × 39 mm(depth) 3.54 inches(height) x 4.92 inches(width) x 1.53 inches(depth)
Weight	0.22 kg
Ambient temperature	0 ~ 50°C * 1)
Humidity	10 ~ 90% (with no condensation) * 1)
Input Voltage	12~24VDC(rating)、 10.2~28.8 VDC(operable)

* 1) Please use this condition when storing and transporting.



Touch Display

3. Check before operation

Please inspect the items in Table 3-1.

Please make sure of “Warning” and “Caution” in this manual.



DANGER



The ARG is only designed to improve the comfort of you and passengers on the ship, and not intended for operation in heavy weather.

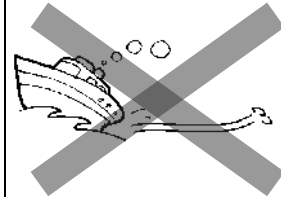
- Do not turn it on in heavy weather, doing so could cause heat generated inside Damper and result in damage to the **ARG**.
- Heavy Weather is referenced and defined by ABA: If heavy weather is forecasted, it should be considered when planning a day out on the water for your safety.



Do not quick-turn repeatedly during the ARG operation.

The **ARG** is intended to suppress rolling of the ship at anchoring or trolling. Repeating quick-turn could change a sense of control of ship.

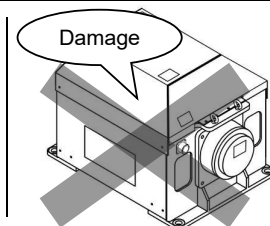
Doing so could result in damage to the ship, malfunction of the **ARG** or accident.



Do not use damaged parts.

Do not use damaged parts.

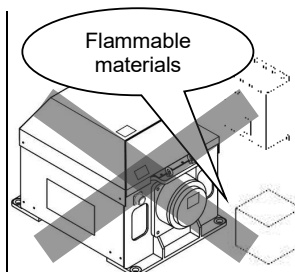
Doing so could result in injury or malfunction. Please contact the dealer whose address is shown at the end of this manual.



Do not place flammable materials near the ARG.

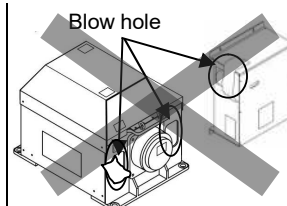
When the **ARG** is in operation, it is heated. Do not place flammable materials or heat-sensitive items (which are deformed or damaged e.g. by heat) near the **ARG**.

Doing so could result in malfunction.


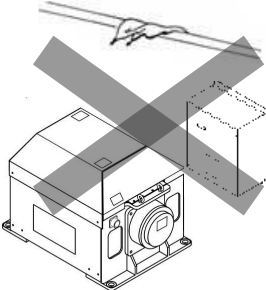



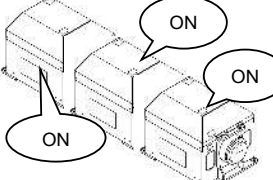

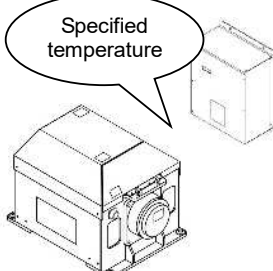

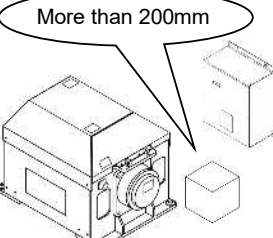

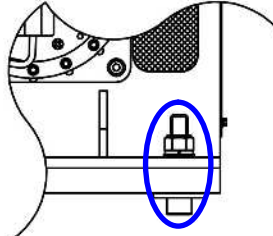


Do not block the ventilation of the ARG.

Blocking the ventilation of the ARG could result in malfunction.



! DANGER

	<p>Never operate the ARG when it is exposed to the seawater / rain.</p> <p>The ARG is not waterproofed. Never operate the ARG when it is exposed to the seawater / rain.</p> <p>Doing so could result in electric shock or malfunction.</p>	
	<p>Do not operate switches with wet hands.</p> <p>Do not operate switches with wet hands. Doing so could result in electric shock.</p>	
	<p>Use all installed ARG units.</p> <p>Use all installed ARG units. Using only a few of them could lead to excessive load and it could result in malfunction.</p>	
	<p>Use the ARG at the specified temperature.</p> <p>Use the ARG unit and Motor driver at the specified temperature. Although ARG unit will be shut down when the temperature gets high.</p> <p>Not doing so could result in malfunction.</p>	
	<p>Keep a space of 200mm (7.9 inches) around the ARG.</p> <p>Since the ARG takes in outside air to ventilate, the space of 200mm (7.9 inches) is required around the ARG (ARG unit and Motor Driver) to provide enough ventilation.</p>	
	<p>Make sure that there is no loose in the mounting bolts, plate or washer.</p> <p>Make sure that there is no loose in the mounting bolts, plate or washer.</p> <p>Not doing so could result in damage to the ARG or ship.</p>	

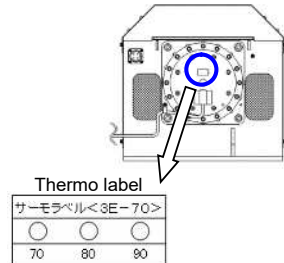
DANGER



Check the discoloration of the thermo label attached to damper.

If the 80 or 90 of the thermo label discolors, contact the Sales Agent.

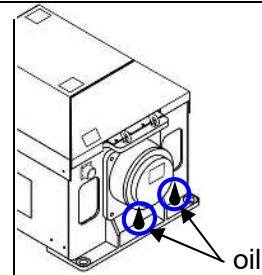
Not doing so could result in damage to the ship, malfunction of the **ARG** or injury.



Do not use the ARG, if there is any oil leakage from the damper.

If there is any oil leakage from the damper, contact the Sales Agent.

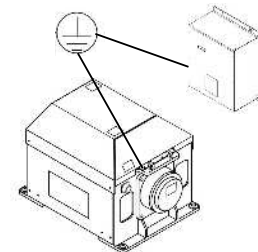
Not doing so could result in damage to the ship, malfunction of the **ARG** or injury.



Connect the ship's ground lead and the ARG unit's ground lead.

Connect the ground lead of each Motor Driver to the ground connection point in the ship.
Ground the **ARG** unit using one of the bolts that secure the unit to the ship.

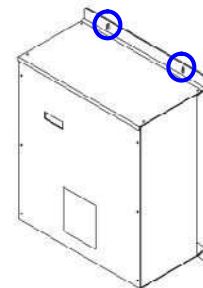
Not doing so could result in electric shock.



Check installation screws of the Motor Driver for looseness every three months.

Re-tighten the four installation screws after operating the **ARG** at sea for a month.
After that, make sure that screws are not loosened every three months.

Not doing so could result in damage to the ship, malfunction or injury.

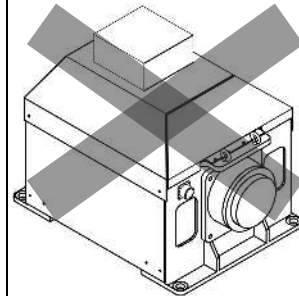


 **CAUTION**



Do not place objects, sit on or step on the ARG cover.

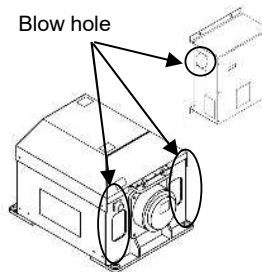
The **ARG** cover is not made of strengthened material.
If you place objects, sit on or step on the **ARG** cover, it could result in damage.
During operation, the **ARG** components inside the cover are rotating at high speed. Therefore, the broken **ARG** cover could cause injury or malfunction.



Do not allow extraneous materials and dust to enter through the blowholes of the ARG.

The **ARG** cover has blowholes for inside cooling. Do not allow extraneous materials and dust to enter through the blowholes of the **ARG**.

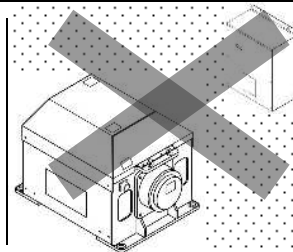
Doing so could result in malfunction.



Do not use the ARG in locations exposed to dust.

The **ARG** cover has blowholes for inside cooling. Do not use the **ARG** in locations exposed to dust.

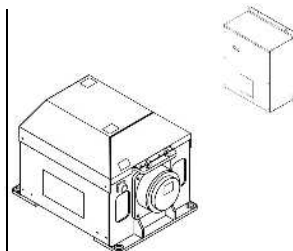
Doing so could result in malfunction.



Be sure to use an exclusive Motor Driver for the ARG.

Be sure to use the Motor Driver supplied by TOHMEI.

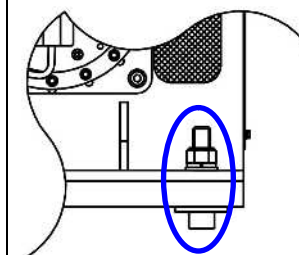
Not doing so could result in malfunction.



Check bolts and nuts (4 installation bolts and nuts) for looseness every three months.

Re-tighten the 4 installation bolts or nuts after operating the **ARG** at sea for a month. After that, make sure that bolts or nuts are not loosened every three months. If you found loosening bolts or nuts, contact the Sales Agent.

Not doing so could result in malfunction.



(1) Pre-operational inspection

Please perform pre-operational inspection shown in table 3-1.

Table 3-1 **ARG** Pre-operational inspection List (1 / 3)

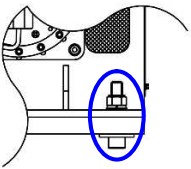
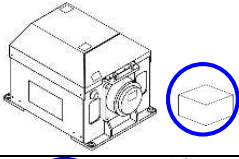
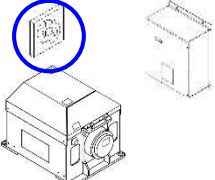
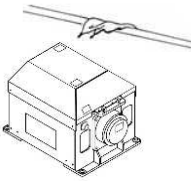
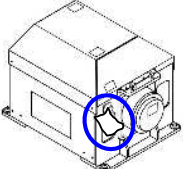
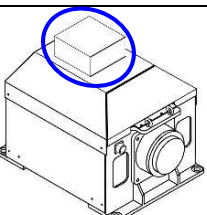
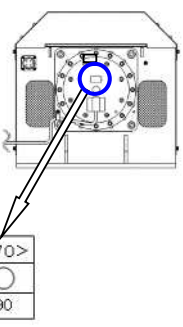
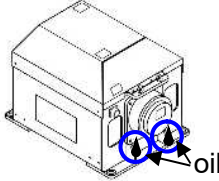
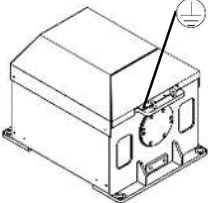
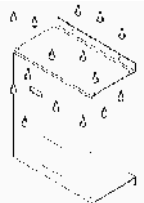

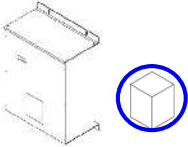

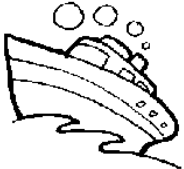
No	Inspection Area	Inspection Item	Priority	Result	Countermeasures
1	ARG installation	There must be no looseness in the installation bolts, nuts (4 bolts and nuts) and spring washer. 	○		Re-tighten bolts or nuts. 〔 Tighten Torque 130N·m 〕
2		There must be no dust, combustibles/flammable materials or seawater / water near the ARG unit. 	◎		Improve installation environment.
3		There must be enough ventilation provided to cool the ARG down. 	○		
4	ARG unit	There must be no trace of being exposed to seawater / water on the ARG unit. 	◎		Contact the Sales Agent. 〔 Do not operate the ARG . 〕
5		The blow hole of the ARG unit must not be closed. 	○		Improve the ARG unit to solve the problems.
6		There must be no objects on the ARG cover. 	○		
7		Check the discoloration of the thermo label as follows. ①No discoloration (all white) ②Red orange (70°C) ③Blue (80°C) ④Red (90°C) 	◎		①② : No problem ③④ : Problem Contact the Sales Agent. (Change the Damper)

Table 3-1 **ARG** Pre-operational inspection List (2 / 2)

No	Inspection Area	Inspection Item	Priority	Result	Countermeasures
8	ARG unit	There must be no oil leakage from the Damper. 	◎		Contact the Sales Agent. 〔 Change the Damper. 〕
9		There must be no looseness in the grounding bolt. 	○		Re-tighten grounding bolt. 〔 Tighten Torque 2.6~2.8 N·m 〕
10	Motor Driver	There must be no trace of being exposed to seawater / water on the Motor Driver. 	◎		Contact the Sales Agent. 〔 Do not operate the ARG . 〕
11		There must be no looseness in the installation screws (four screws). 	○		Re-tighten screws.
12		There must be no dust, combustible/flammable materials or seawater/water near the Motor Driver. 	◎		Improve installation environment.
13		The blow hole of the Motor Driver must not be closed. 	○		Improve the Motor Driver to solve the problem.
14	Others	Check sea area that the ARG is operated. ・ Do not operate in heavy weather, with high waves or strong winds. 	◎		—

4. Operating the ARG

Please operate the **ARG** according to the procedure below.
Please make sure of “**Warning**” and “**Caution**” in this manual.

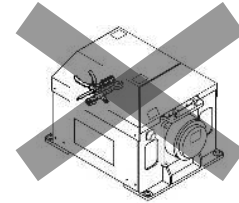
DANGER



Do not remove the ARG cover.

During operation, the inner parts of the **ARG** are rotating at high speed. Do not remove the **ARG** cover.

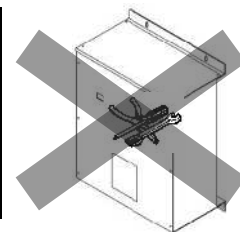
Doing so could result in injury.



Do not open the Motor Driver's lid.

Do not open the Motor Driver's lid. And do not touch the inside of the Motor Driver.

Doing so could result in electric shock, or malfunction.

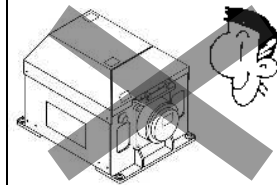


CAUTION



Do not approach the ARG unit during operation.

Do not approach the **ARG** unit during operation.
Doing so could result in injury.

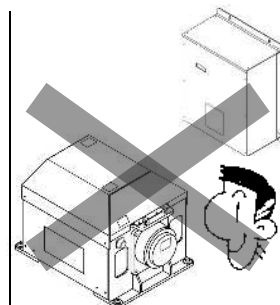


Do not approach the ARG unit and the Motor Driver until the ARG completely stops.

It takes approximately 1 hour until the **ARG** completely stops after the remote switch has been turned off.

Do not approach the **ARG** unit and the Motor Driver until the **ARG** completely stops.

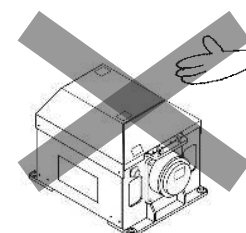
Doing so could result in injury.



Do not touch the ARG unit.

Do not touch the **ARG** unit during operation or soon after the **ARG** stops because the **ARG** is hot.

Doing so could result in a skin burn due to the hot surface.

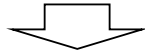


4.1 Method of operation

Please operate the **ARG** according to the procedure below.

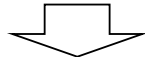
(1) Starting

① "Turn ON" the battery switch.

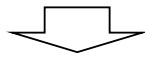


※Due to the characteristics of the power inverter, there is a time lag of about 10 seconds until power is supplied after the main switch is turned on.

② "Turn ON" the circuit breaker switch.



③ "Turn ON" the Touch Display switch by touching the switch.

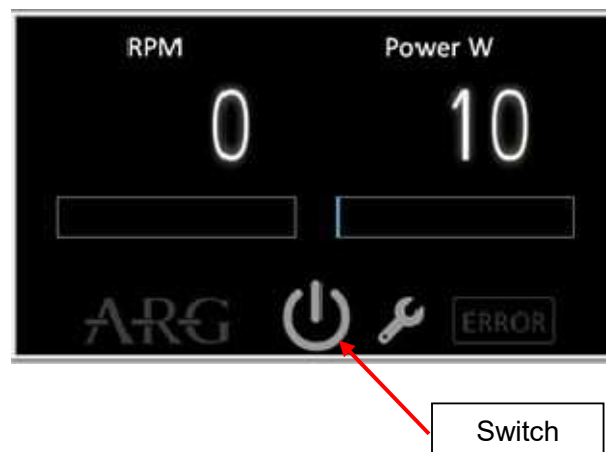


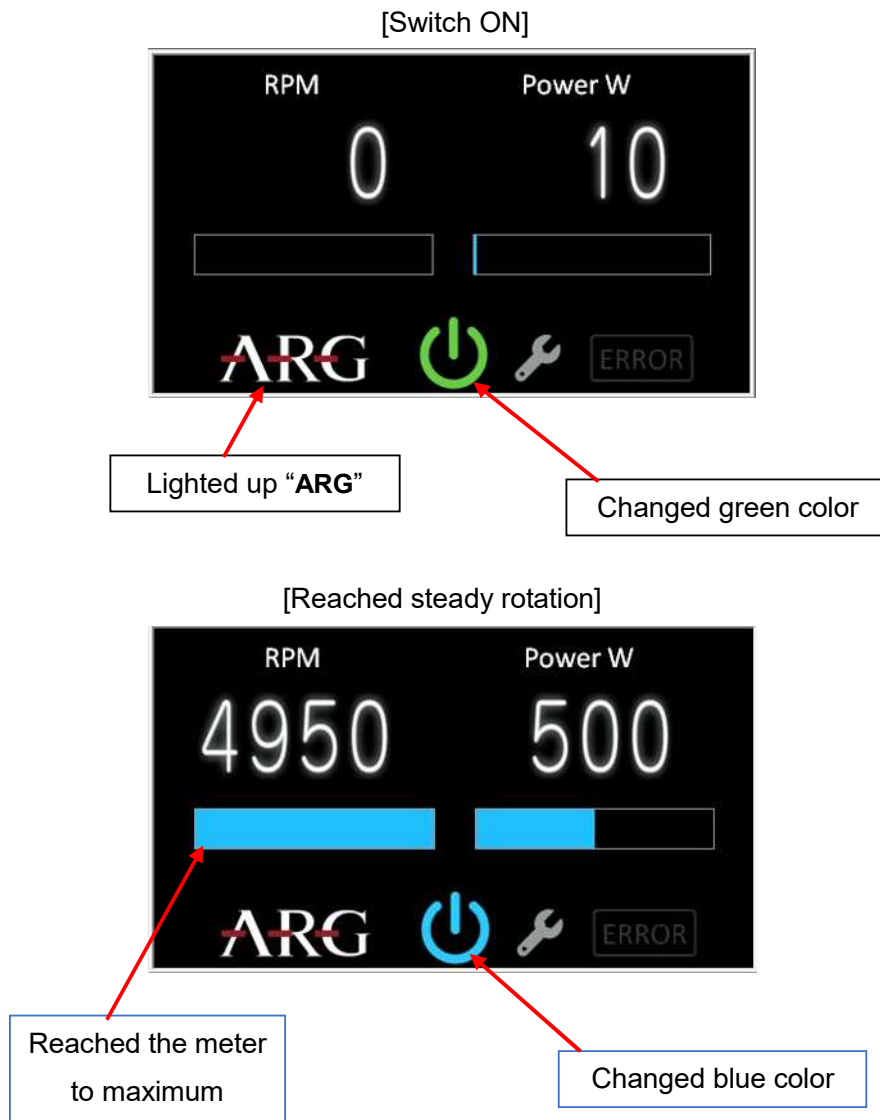
< 30 minutes later*1 >

④ If the test run is performed on the sea, anti-rolling function becomes effective in approximately 30 minutes after starting.

The Initial screen is indicated to the Touch Display when you turn on the power to the Touch Display. You can operate the **ARG** in this screen. You can operate the **ARG** to start/stop and check the Starting and the Reaching steady rotation. Indication are from left, rotation speed of fly wheel "RPM" and power consumption (previous power of the Power Inverter) "Power W".

[Initial state]

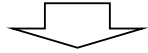




*1) The **ARG** takes approximately 30 minutes to reach rated rotational speed after turning on the Touch Display switch.

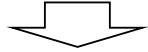
(2) Stopping

① "Turn OFF" the Touch Display switch by touching the switch. *1



② Make sure that the Touch Display switch is gray color.

③ "Turn OFF" the circuit breaker switch.



⑤ "Turn OFF" the battery switch.

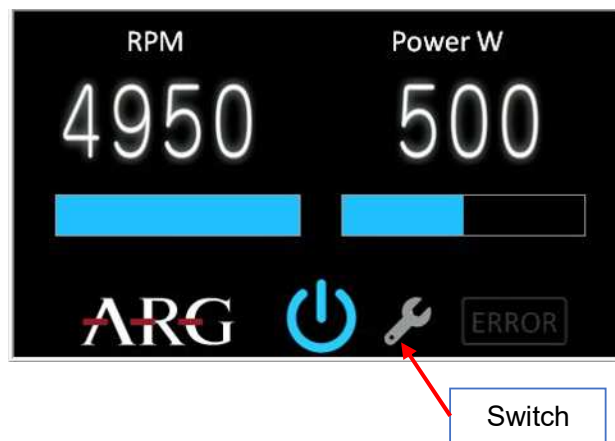
*1) After turning off the power supply to the **ARG**, the **ARG** stops its operation gradually.
It takes approximately 1 hour until the system stops completely.

(3) Maintenance screen

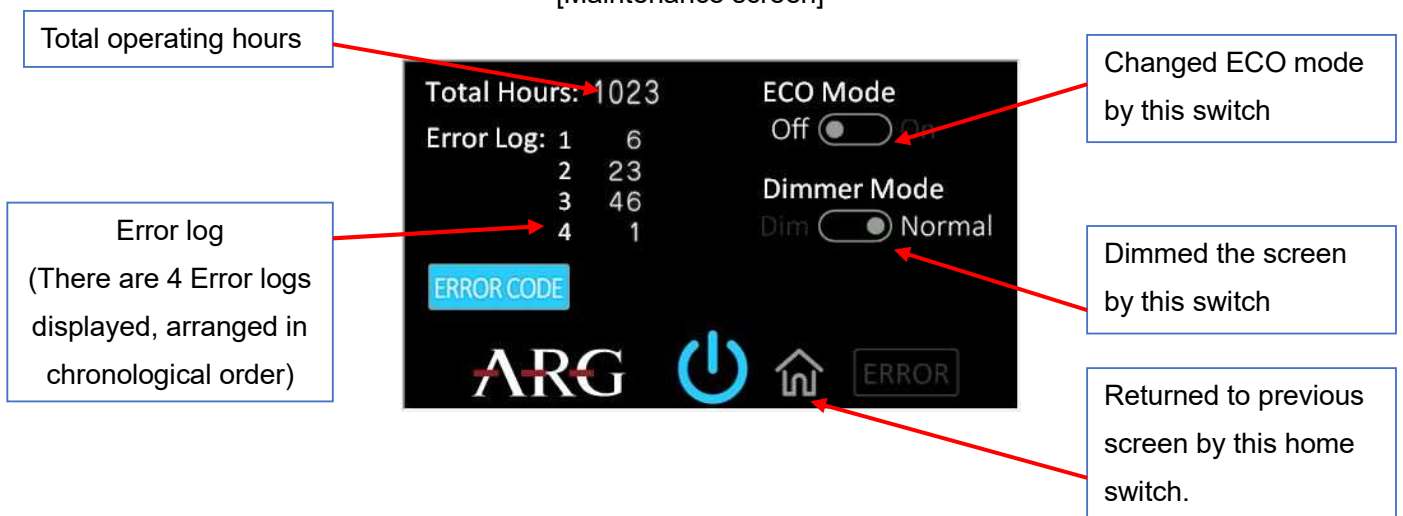
You can change the Touch Display screen to maintenance screen by touching the switch to the left of the Touch Display switch. In this screen, you can change the **ARG** to ECO mode. Eco mode is a mode that reduces battery power consumption by slowing down the steady rotation speed of the fly wheel. Use ECO mode when the ship doesn't shake much because of low waves or when you want to make the batteries last longer.

In the other, you can dim the Touch Display screen and check the error log, error code and the total operating hours.

[Reached steady rotation]



[Maintenance screen]



(4)Error indication

You can confirm the error occurred. If the error occurs, the **ARG** is turned OFF and the “ERROR” is lighted up to red color. You can clear the error by touching the “RESET”. But, when the error state is still remained, you can't clear the error even if you touch the “RESET”. In that case, please contact your dealer.

[Error occurrence screen]



Lighted up to red color

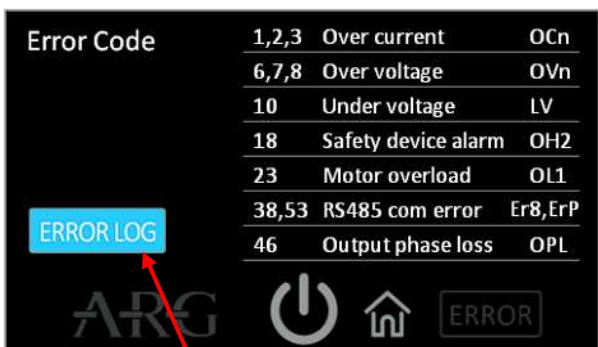
[Error log screen]



Cleared error by touching the “RESET” lighted up to green color.

Indicated error descriptions by touching the “ERROR CODE” lighted up to blue color.

[Error code screen]



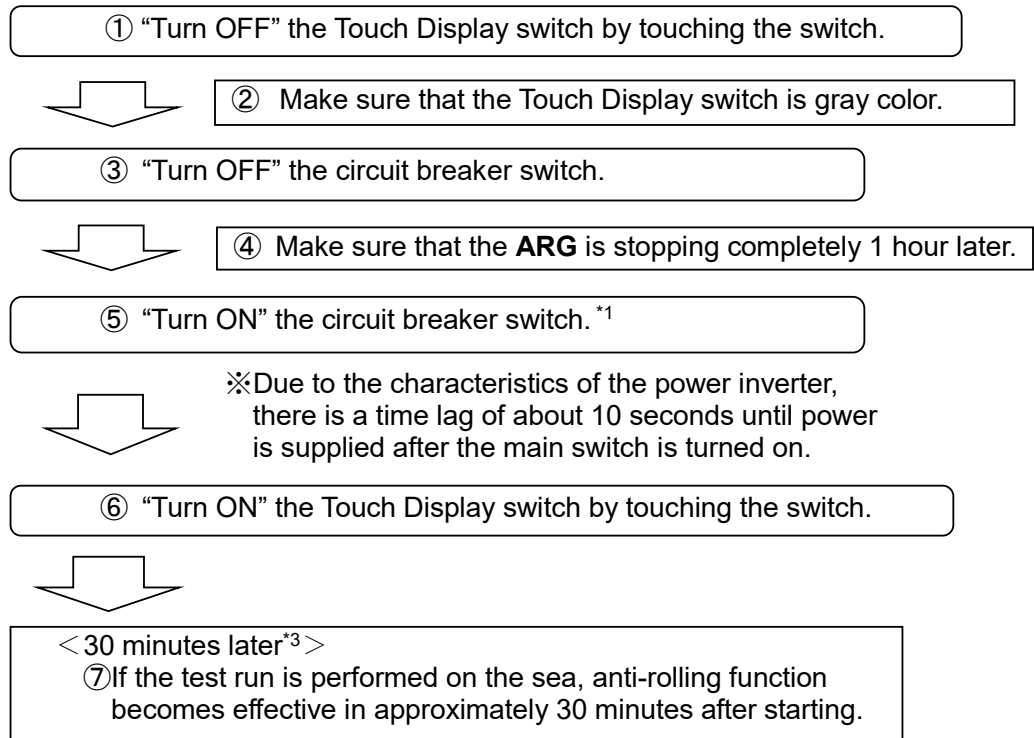
Returned to previous screen by touching again the “ERROR LOG”

[Error code table]

code	contents	
1,2,3	Over current	OCn
6,7,8	Over voltage	OVn
10	Under voltage	LV
18	Safety device alarm	OH2
23	Motor overload	OL1
38,53	RS-485 com error	Er8, ErP
46	Output phase loss	OPL

4.2 Restarting

Operate the **ARG** according to the procedure below if the **ARG** is restarted due to anomalies.



*1) If you turn on the switch back before the **ARG** unit has stopped completely, self shut down circuit may occur due to over current.

In this case, release the over current protector of the Motor Driver and then restart the **ARG**.

It will be better not to restart the **ARG** for at least 1 hour after shut down.

*2) The **ARG** takes approximately 30 minutes to reach rated rotational speed after turning on the remote switch.

4.3 Fast return functions

(1) Description of the functions

The **ARG** has a function called “Fast return functions”. It is a function that the **ARG** will not be turned off even when the batteries are turned off for a moment. This function is valid under the following conditions.

- If the ship temporary uses an electricity from the ground (Shore Power) to start the **ARG** and then change it from the ship (power generator) to supply the electricity.
- If there are some power generators on the ship and want to change the generator to get applicable electric capacity during the **ARG**'s operation.

A customer does not need to prepare extra parts or wirings to get this function.

(2) Procedure for Fast return function

Table 4-2 describes the procedure to recover the **ARG** after the Touch Display switch is temporarily turned off. When you use this fast return function, check this table procedure, and Touch Display screen all the time.

Table 4-2 Procedure for Fast return function

No.	Operation	ARG's condition	Power generator	Touch Display	
				Touch Display switch	Switch color
1	The ARG is in operation	Steady-state rotational speed	ON	ON	Blue
2	Change the Touch Display switch (Turn off the switch)	Reduce the rotational speed	ON	OFF	Gray
3	Change the Touch Display switch (Turn on the switch)	Restarting	ON	ON	Green
4	—————	Steady-state rotational speed	ON	ON	Blue

Note 1) When temporarily turning off the Touch Display switch with the fast return function used, keep the power generator ON all the time. If you change it to OFF during its operation, the protective function of the Motor Driver will be started and the whole system will be stopped.

Note 2) If you operate the **ARG** for the first time, follow the procedure below and Section 4.1 “Method of operation”.

- ①Turn on the main power generator → ②Turn on the circuit breaker switch
→ ③Turn on the Touch Display switch

4.4 Safety functions

The **ARG** has a safety device to stop the **ARG** automatically.
When the **ARG** is operated under the following conditions, the safety device operates and the **ARG** stops.

- The **ARG** generates excessive load by the operation under stormy weather or excessive high wave condition.
- Ambient temperature of the **ARG** becomes high.

If the safety device operates, the “ERROR” in Touch Display screen is lighted up red color even when the Touch Display switch is still “on”. (Refer to Figure 4-4)
And error log is indicated “18” in error log screen.
Please contact the ARG dealer according to No.5 of Table 5-1 in paragraph 5, if there is possibility that the safety device operates.

[Error occurrence screen]



Lighted up red color

[Error log screen]



Indicated “18”

[Error code screen]

Error Code	Description	Code
1,2,3	Over current	OCn
6,7,8	Over voltage	OVn
10	Under voltage	LV
18	Safety device alarm	OH2
23	Motor overload	OL1
38,53	RS485 com error	Er8,ErP
46	Output phase loss	OPL

The screenshot shows a black background with white text. At the top left, 'Error Code' is displayed. Below it is a table with three columns: 'Error Code', 'Description', and 'Code'. A blue 'ERROR LOG' button is at the bottom left. At the bottom, there are icons for 'ARG', a power button, a home button, and a red 'ERROR' button. A red arrow points from the 'OH2' code in the table to a text box on the right.

Error contents
(caution by safety device)

Figure 4-4 Touch Display screen when safety device operating

4.5 Power Invertor

When the battery capacity decreases, the unit detects a voltage drop (10.5V or less) and shuts off the power supply, and an alarm sound.


The alarm will continue to ring if it is not released. so please switch the main switch on the back of power invertor to the center (○) position on first, turn it ON (-) again on second. Or, please turn the battery switch off on first, turn it on again on second.




Main switch OFF
or
Battery switch OFF

5. What to do in case of problems

Before contacting to the Sales Agent, please check your problems according to Table 5-1. If problems are not applicable to Table 5-1, please enter in Table 5-2 and contact the Sales Agent.


DANGER



Turn off the power supply if you notice abnormal conditions.

If you notice an unusual noise, vibration or any other abnormality during operation of the **ARG**, immediately turn off the power supply to shut down the **ARG**.
Keeping the **ARG** running under abnormal conditions could result in unexpected accident.

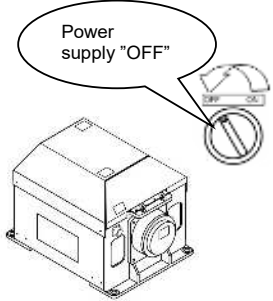


Table 5-1 Fault finding table for the **ARG**

No.	Problem	Possible cause	Step to take
1	The ARG does not operate even though the power switch is ON.	Power circuit is incorrectly wired.	<ul style="list-style-type: none"> Check if primary power is available. Check the connection between the power supply and the ARG.
		Signal circuit is incorrectly wired.	<ul style="list-style-type: none"> Check the Safety device wiring whether it is not broken. Check the connection between the Motor Driver and the ARG unit.
		Drive circuit is incorrectly wired.	<ul style="list-style-type: none"> Check the Touch Display wiring whether it is not broken. Check the connection between the Motor Driver and the ARG unit.
		Circuit breaker switch is not turned on.	<ul style="list-style-type: none"> Turn on the circuit breaker switch again according to the procedures in this manual.
		Buttery Power is not producing enough power.	<ul style="list-style-type: none"> Check the capacity of the buttery power, which must be fully charged.
		Restart of the ARG is attempted before it completely stops after shutdown.	<ul style="list-style-type: none"> Stop the ARG completely, and then restart according to the procedures in this manual.
		The Touch Display switch is not "ON"	<ul style="list-style-type: none"> Turn the Touch Display switch on.
2	Circuit breaker switch trips immediately after it has been turned on.	Power circuit is incorrectly wired.	<ul style="list-style-type: none"> Check the short circuit of the power circuit between the battery and the ARG unit.
		Ground fault.	<ul style="list-style-type: none"> Check the short circuit of the power circuit between the battery and the ARG unit.

Table 5-1 Fault finding table for the **ARG**

No.	Problem	Possible cause	Step to take
3	The ARG stops after turned on or during the operation	The power is not enough in the battery.	<ul style="list-style-type: none"> • Check the capacity of the battery power, which is more than the sum of the one of the ARGs. • The battery power to supply the ARG is also used for another equipment, which consumes large amount of electricity and it causes the battery power to insufficiently produce the power.
		Electric shut down because of turning other equipment on.	<ul style="list-style-type: none"> • If other equipment is turned on, it decreases the voltage momentary and it stops the ARG. Please turn on the equipment first, and then turn the ARG on.
		Operation of the safety device	<ul style="list-style-type: none"> • When the ARG is operated under high ambient temperature, stormy weather or excessive high wave conditions, the ARG may stop. Cool the ambient temperature by ventilation, and contact the Sales Agent.
4	GPS , radio or other equipment makes noise after the ARG is in operation.	The ARG 's noise is affecting other equipment's noise.	<ul style="list-style-type: none"> • Keep the distance between other equipment and the ARG and/or its wirings. (Noise may be superimposed on AM radio depending on the location.) • Check the ground lead between the ARG and the ship. • <u>Adjust sensitivity when the image of the Fish Finder is noisy and distorted. Refer to the operation instructions of the Fish Finder.</u>
5	The ARG makes unusual noise or vibration.	Selected wrong rotational direction.	<ul style="list-style-type: none"> • Make sure that the serial numbers of the ARG unit and the Motor Driver are the same.
		Effect of resonance	<ul style="list-style-type: none"> • There is a mechanical resonance point in the ARG during the time that rotational speed becomes steady. Please wait until it becomes steady rotational speed. • If there is a resonance in the hull or wall, take appropriate measures to increase the strength and rigidity of the material of the hull or wall.
		Effect of environmental temperature.	<ul style="list-style-type: none"> • When the environmental temperature is low, the bearings might make some noise especially just after the starting. Wait until the rotational speed becomes steady, and then make sure that it does not make the noise any longer.
6	Oil bleeding / leakage from the damper	Early familiarity in damper	<ul style="list-style-type: none"> • Oil adhering to the seal area during damper manufacturing may temporarily come out. Wipe it off and check for leaks again. • If the leak continues, please contact the sales agents.

Table 5-2 Check sheet

Discrepancy Inquiry Sheet (form for users)		Prepared by _____	Date: _____		
		Control number: _____			
1.	Please fill in the blanks after TYP, P/N and S/N with the appropriate indications on the information plate of ARG.	TYP: _____	P/N: _____ S/N: _____		
2.	Information on user	User name	_____		
		Name of ship	_____		
		Material and application of vessel	Material: iron, aluminum, GFRP, others () Application: _____		
		Size of vessel	Overall length: _____ overall width: _____ displacement: _____ tons		
3.	Mounting method and operation of ARG	Mounting method (directly or through anti-vibration rubber)	Anti-vibration rubber: provided <input type="checkbox"/> not provided <input type="checkbox"/>		
		Number of units installed	_____		
		Number of units showing discrepancy	_____		
		Condition for operation	Duration in service: _____		
		Mounting position of ARG showing discrepancy, and peripheral devices	_____		
		Capacity of power generator	Single-phase · 3-phase, 200·220·240V, ()KVA, ()A		
4.	Date of last inspection and inspection results	About what time was the last inspection?	About (Year) _____ (month) _____		
		Were there found any results related to the event of this time?	YES · NO · Unknown		
5.	Approximate cumulative operation time or approximate period of operation time	Hr _____			
6.	Time at or duration in which you feel there is some discrepancy, and symptom making you feel so	Time at which you recognized discrepancy and duration in which operation has been sustained after that	Operation has been sustained-stopped from _____ (year/month /day).		
		Describe differences in conditions of ARG before and after discrepancy was revealed.	_____		
		Describe operating conditions of ship before and after discrepancy was revealed. Large rolling caused by sharp turning, unexpected big wave, sudden gust, etc. or changes in power supply conditions resulted from installation of new auxiliary equipment, and so on	_____		
7.	Kind of discrepancies (Select appropriate items and explain conditions.)	Kind of discrepancies	Tick off	Answer to questions in following items if appropriate.	Conditions
		Start check lamp and/or rotation rate check lamp not illuminated	<input type="checkbox"/>	13. ~ 17.	
		Operation not started even if switch is turned on.	<input type="checkbox"/>	13. 14. 16. 17.	
		Operation interrupted (impossible to restart)	<input type="checkbox"/>	8. ~ 11. 14. ~ 17.	
		Noise increased (larger than in conventional operations)	<input type="checkbox"/>	8. ~ 11. 14. ~ 17.	
		Vibration increased (larger than in conventional operation)	<input type="checkbox"/>	8. ~ 11. 14. ~ 17.	
		Abnormal noise generated (not experienced in conventional operations)	<input type="checkbox"/>	8. ~ 11. 14. ~ 17.	
		Abnormal odor generated (not experienced in conventional operations)	<input type="checkbox"/>	9. 10. 12. 15.	
Other abnormal conditions	<input type="checkbox"/>	9. 10. 15. ~ 17.			
8.	Is mounting to hull free from any loose bolt?	YES · NO (Conditions: _____)			
9.	Is damper free from any oil leaks? (Note that oil is transparent.)	YES · NO (Conditions: _____)			
10.	What degree of temperature is indicated by thermo label attached to damper?	White: normal Other colors: 70°C 80°C 90°C			
11.	At a time of what have noises or vibrations occurred, at starting, at a steady rate operation or at all times? How long did they last, for a certain period or continuously? How is the noise heard? (What kinds of sound are generated?)	Abnormal noise · vibration Occurred at: starting · a steady rate operation · all times · others (Conditions: _____)			
12.	Kind of abnormal odor	Examples: smell of burnt oil, smell offensive to eyes, smell of burnt bakelite	_____		
		What is source of odor?	ARG proper · motor driver · lamp · switch · others (Conditions: _____)		
13.	Findings from electrical system checks	is Primary power available?	YES · NO (Conditions: _____)		
		is Power cable free from open-circuit?	YES · NO (Conditions: _____)		
		is the Breaker on?	YES · NO (Conditions: _____)		
		<Except ARG175T > is ARG connector free from loose contact? (Is it latched properly when plug ring is turned?)	YES · NO (Conditions: _____)		
		Is motor driver fan in operation? (Fan rotation sound heard?)	YES · NO (Conditions: _____)		
		Is remote switch wiring free from any open-circuit?	YES · NO (Conditions: _____)		
		Is system free from any blown lamp bulb? is grounding to hull in good condition?	YES · NO (Conditions: _____)		
14.	Are starting and stopping performed in the same procedure as specified in Operation Manual?	YES · NO (Conditions: _____)			
15.	What degree is the ambient temperature? What is the atmospheric temperature in ARG installation place when ARG is in operation?	Approx. _____ °C			
16.	Has ARG been protected against splashes of sea water? (Is it free from any trace of exposure?)	YES · NO (Conditions: _____)			
17.	Is ARG free from any accumulation of powder or dust?	YES · NO (Conditions: _____)			

6. Maintenance

Please inspect the **ARG** every two years. (Refer to Table6-1)
 Please read and understand the “**Warning**” and “**Caution**” in this manual before inspection.
 TOHMEI recommends you to have the periodic inspection performed by the dealer every two years to make sure you can use it safely for a long time. This inspection will be charged for.
 Please contact the Sales Agent for details.

Especially, if there is oil leakage from the Damper, it may result in decline of the Damper’s function. Please have the periodic inspection of the dealer.

And change the Damper, the Motor Driver and the Cover, accordance with results of periodic inspection.

Please contact the Sales Agent for the periodic inspection or change of the **ARG**’s parts.

Spare Parts
Damper
Motor Driver
Cover

DANGER

	<p>Do not pull on the cables from the Motor Driver.</p> <p>Do not pull on the cables from the Motor Driver. Doing so could result in electric shock.</p>	
	<p>Do not disassemble or modify the ARG or use a substitute for any of its parts.</p> <p>Do not disassemble the ARG by yourself, change the component (without authorized modification), or use it for any purpose other than that for which it was designed.</p> <p>Doing so could result in damage to the ARG, malfunction, injury or electric shock.</p>	
<p>Do not remove the ARG cover.</p> <p>During operation, the inner parts of the ARG are rotating at high speed. Do not remove the ARG cover.</p> <p>Doing so could result in injury.</p>		
<p>Do not open the Motor Driver’s lid.</p> <p>Do not open the Motor Driver’s lid. And do not touch the inside of the Motor Driver.</p> <p>Doing so could result in electric shock, or malfunction.</p>		

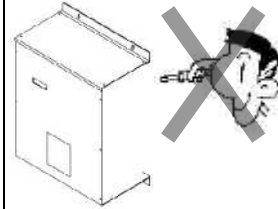
DANGER



Contact the Sales Agent for wiring of the ARG.

Be sure to contact the Sales Agent for wiring of the ARG.

Incorrect wiring could result in electric shock, or malfunction.

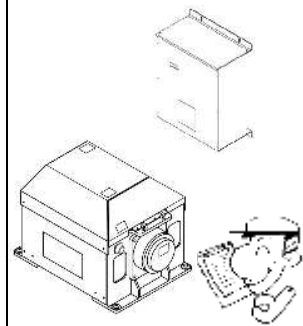


Have the periodic inspection performed by the Sales Agent every two years.

Have the periodic inspection performed by the Sales Agent every two years.

Change the Damper, the Motor Driver, the Cover and the anti-vibration rubber with accordance with results of periodic inspection.

Not doing so could result in electric shock, damage or malfunction.



CAUTION



Check the bolts and nuts (4 installation bolts and nuts) for looseness every three months.

Re-tighten the eight installation bolts or nuts after operating the ARG at sea for a month.

After that, make sure that bolts or nuts are not loosened every three months. If you found loosening bolts or nuts, contact the dealer.

Not doing so could result in malfunction.

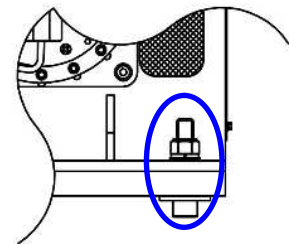


Table 6-1 **ARG** Periodical inspection List (1 / 4)

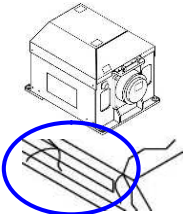
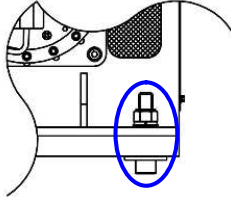
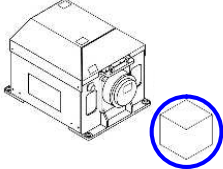
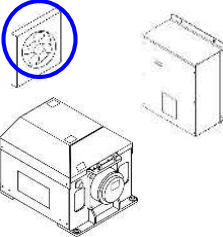
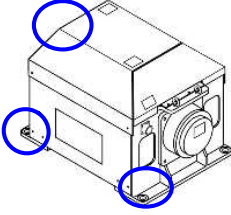
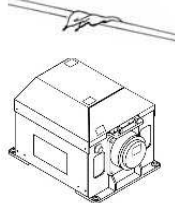
No	Inspection Area	Inspection Item	Priority	Result	Countermeasures
1	ARG Installation	There must be no rust, crack or gap on the installation part of the hull. 	○		Improve the hull to solve the problem.
2		The installation bolts and nuts must be tightened to the regular torque as below. 130N · m 	○		Re-tighten bolts or nuts.
3		There must be no dust, combustibles /flammable materials or seawater/water near the ARG unit. 	◎		Improve installation environment.
4		There must be enough ventilation provided to cool the ARG down. 	○		Improve installation environment.
5	ARG unit	The ARG unit must be no rust, crack or damage caused by interference of the ARG unit and other equipment. 	○		Contact the dealer. (Change the damaged parts or the ARG unit.)
6		There must be no trace of being exposed to seawater / water on the ARG unit. 	◎		Contact the dealer. (Do not operate the ARG .)

Table 6-1 **ARG** Periodic inspection List (2 / 4)

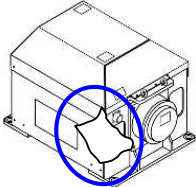
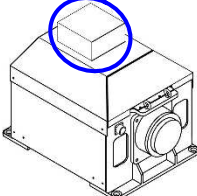
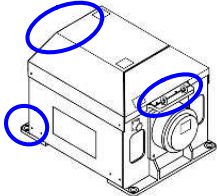
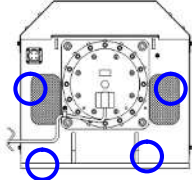
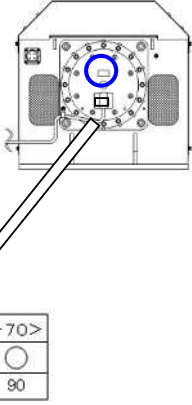

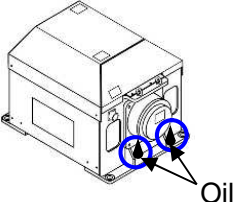
No	Inspection Area	Inspection Item	Priority	Result	Countermeasures
7	ARG unit	The blowhole of the ARG unit must not be closed. 	○		Improve the ARG unit to solve the problem.
8		There must be no objects on the ARG cover. 	○		Improve the ARG unit to solve the problem.
9		There must be no looseness in the screws of the Cover. 	○		Re-tighten screws with glue. 〔 Tighten Torque 2.6 to 2.8N·m 〕 And contact the dealer.
10		There must be no looseness in the bolts of the Damper. 	◎		Contact the dealer. 〔 Inspect the ARG and, change damaged parts. 〕
11		Check the discoloration of the thermo label as follows. ① No discoloration (all white) ② Red orange (70°C) ③ Blue (80°C) ④ Red (90°C)  	◎		①② : No problem ③④ : Problem Contact the dealer. 〔 Change the Damper. 〕
12		There must be no oil leakage from the Damper. 	◎		Contact the dealer. 〔 Change the Damper. 〕

Table 6-1 **ARG** Periodic inspection List (3 / 4)

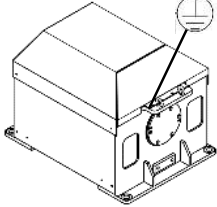
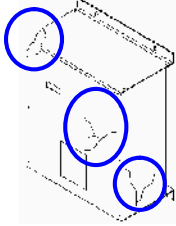
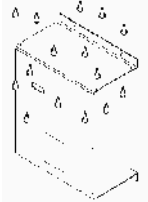
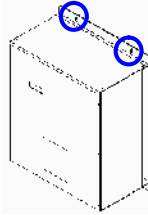
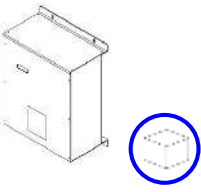
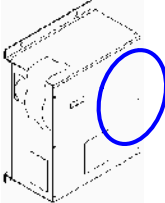

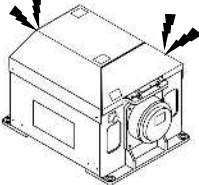
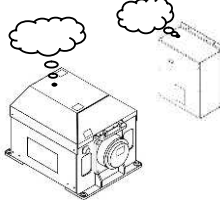

No	Inspection Area	Inspection Item	Priority	Result	Countermeasures
13	ARG unit	There must be no looseness in the grounding bolt. 	○		Re-tighten grounding bolt. (Tighten Torque 2.6~2.8 N·m)
14	Motor Driver Power Inverter	There must be no rust, deformation or crack. 	○		Contact the dealer. (Change the Motor Driver.)
15		There must be no trace of being exposed to seawater / water on the Motor Driver. 	◎		Contact the dealer. (Do not operate the ARG.)
16		There must be no looseness in the installation screws (four screws). 	○		Re-tighten screws.
17		There must be no dust, combustible /flammable materials or seawater/water near the Motor Driver. 	◎		Improve installation environment
18		The blowhole of the Motor Driver must not be closed. 	○		Improve the Motor Driver to solve the problem.


Table 6-1 **ARG** Periodic inspection List (4 / 4)

No	Inspection Area	Inspection Item	Priority	Result	Countermeasures
20	Operation	The operating color (green) and steady rotation reaching color (blue) on the touch display should light up. 	○		Contact the dealer.
21		There must be no unusual noise or vibration. 	○		Contact the dealer.
22		There must be no abnormal odor from the ARG proper and Motor Driver. 	○		(Inspect the ARG .)

7. Installation

To install the **ARG**, it is necessary to reinforce the ship appropriately and to provide an appropriate power supply (battery).
Please be sure to contact the dealer.

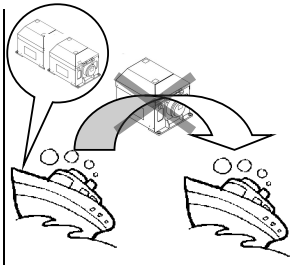
 **CAUTION**



Do not divert the ARG unit or the Motor Driver already installed to other ships.

The model and numbers of the **ARG** are decided for each ship.

Diverting them to other ships could result in malfunction.



8. Compliance with European standards

The CE marking on **ARG** indicates that they comply with the essential requirements of the Machinery Directive: 2006/42/EC, the Low Voltage Directive (LVD): 2014/35/EU and the Electromagnetic Compatibility (EMC) Directive: 2014/30/EC issued by the Europe. They conform to the following harmonized standards.

By connected with external EMC filter(Okaya; 3SUP-HE50-ER-6, TDL-Lambda; RTEN-5060), ARG satisfy EMC Directives.

Using the following harmonized standards

Machinery Directive	: EN ISO 12100:2010
Low Voltage Directive	: EN 60204-1:2006+A1:2009
EMC Directives	: EN 61000-6-2:2005
	EN 61000-6-4:2007+A1:2011

9. Compliance with Ignition Protection

ARG45T satisfy the requirements of Ignition Protection by conducting structural evaluation (except Motor Driver and Power Inverter) and test evaluation according to UL1500 "STANDARD FOR IGNITION-PROTECTION TEST FOR MARINE PRODUCTS-EDITION3".

Sales Agent

販売店

Manufacture

製造業者



ANTI ROLLING GYRO

TOHMEI

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