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## User's Guide

### Hitachi Inverter

#### Analog Input/Output Option

#### P1-AG

After reading this guide, keep it handy for future reference.

The table of contents is organized into two main categories: 'Fundamental' and 'Verification'. A red bracket on the left side groups chapters 1 through 6 under 'Fundamental', and a green bracket groups chapters 7 and 8 under 'Verification'. Chapter 7, 'FAQ and Troubleshooting', is highlighted with a dark grey background.

Fundamental	S	Introduction · Cautions
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When contacting us, please let us know the following reference number.

NT260X

## S.1 Introduction

Thank you for purchasing the P1-AG: analog input/output option for Hitachi SJ series P1 (afterward, "Hitachi SJ series P1" referred as SJ-P1). This user's guide describes how to handle and maintain the P1-AG. Please read this guide carefully before using the P1-AG, and keep it handy for those who operate, maintain and inspect it.

### ■ About the User's Guide (this document)

The User's Guide provides detailed information necessary for handling the product. Please make sure to read the User's Guide for proper use.

Always use the P1-AG strictly within the range described in the User's Guide and perform proper inspection and maintenance to prevent failures or accidents.

For the latest version of the User's Guide, please contact the supplier where this device was purchased.

### ■ Handling the inverter

For handling the inverter, please make sure to read its Basic Guide and User's Guide.

## S.2 Cautions

### ■ For a proper use

Before using the inverter, please read carefully the inverter's Basic and User's Guide, and this guide.

In Addition any personnel who handles or performs maintenance to the product must read carefully the inverter's Basic and User's Guide, and this guide.

Before any attempt to install, operate, maintain or inspect this equipment, a complete understanding of the equipment specifications, safety instructions, precautions, handling and operation instructions is required. Additionally, periodically review the inverter's Basic and User's Guide, and this guide.

### ■ Precautions

It is prohibited to reproduce or reform this document partially or totally in any form without the publisher's permission.

The contents of the document are subject to change without prior notice.

If a hard copy of this document is required please contact the nearest sales office. Keep in mind that you will be charged for a hard copy of this document.

Any handling, maintenance or operation method NOT described on the inverter's Basic and User's Guide, and this guide is not covered by the product warranty. Please DO NOT perform any procedure NOT described on the SJ-P1 or the P1-AG guides since it can be the cause of unexpected failures or accidents.

We are not responsible for any impact from operations regardless of unexpected failure or accident due to operation or handling of the product in a manner not specified on the inverter's Basic and User's Guide, and this guide. We appreciate your understanding.

If you find any unclear or incorrect description, missing description or misplaced or missing pages, Please inform the Hitachi inverter technical service office.

Note that, in case the inverter's Basic and User's Guide, and this guide are enclosed, they should be delivered to the end user of the inverter. Also make sure to download and keep accessible any other related guides or instructions for the end user.

### S.3 Product Warranty and inquiry

#### ■ About product inquiry

- For an inquiry about product damage or faults or a question about the product, notify your supplier or Hitachi inverter technical service office. When contacting the technical service, please provide the following information.

- Model: P1-AG
- Manufacture Number (MFG No.):  
It shows on the name plates.  
(Please refer to the chapter 3, for more information.)
- Date of Purchase: Purchase date by the customer
- Inquiry contents:
  - Inform us the defective point and its condition.
  - Inform us the suspicious content and its details.

#### ■ Product warranty

- The product P1-AG will be warranted by Hitachi Industrial Equipment Systems Co., Ltd. (afterward, referred as "Hitachi") during the warranty period from your date of purchase only under proper usage of product.
- However, the warranty expressed here is covered only for products delivered from Hitachi, and will not be responsible for others damage or loss of products like a motor or any equipment or systems damage caused by improper usage of the product. We recommend applying safety design which is able to provide a hazard notice to the user in case of malfunction or damage of the delivered product to minimize the consequences on other equipment or system. We advise that the selection of the delivered product is done with sufficient margin for performance, as well as using redundant design for other equipment or systems. Also, the compatibility of the product with the customer's intended use is not warranted, hence is the customer responsibility to perform validation tests before any operation.
- The product will be warranted for one year from the date of purchase. However, depending on the case, actual expenses for sending technical assistance will be charged to the customer. Also, Hitachi will not be responsible of any readjustment or testing on site.
- In case a defective product is delivered, or defects on quality during the manufacturing process are detected, Hitachi will repair or exchange the product free of charge, only during the product warranty period (afterward, referred as "warranty service").

- After a warranty service, the exchanged or repaired part will be warranted for 6 months from the date of the warranty service. Hitachi will be responsible for repairing or exchanging the previously exchanged or repaired part only during this warranty period.
- In order to receive warranty service, you should present the receipt issued by the product supplier or any other document that allow us to check the purchase date. However, any defects, damage, malfunction or any other failure caused by one of the following facts will not be covered by warranty service.

- (1) Cannot confirm the purchase date.
- (2) The damage or fault resulted from improper usage or inadequate handling of the product or usage that does not comply with the instructions described in the user's guide or basic guide.
- (3) Incorrect usage of the product and/or the inverter, inadequate setting of the product and/or the inverter, remodeling or inadequate repair or repair carried out by an unqualified repair center.
- (4) Deterioration and wear as result of normal operation.
- (5) Fault resulted from natural disaster, such as earthquake, fire disaster, lightning strike, pollution, salt pollution, or abnormal voltage or any others external factors.
- (6) Shock, falling, or Vibration resulted during transportation or displacement after purchase.
- (7) Damage or fault resulted from remodeling firmware by unqualified personal not belonging to Hitachi.
- (8) Damage or fault resulted from using a function program (EzSQ).

#### ■ Liability limitation

- In this product warranty, all warranties offered to the customer are stipulated, and neither Hitachi, affiliated companies or related dealers are liable to any express warranties or implied warranties including, but not limited to, product merchantability or specific application fitness.
- Also, Hitachi, affiliated companies or related dealers are not responsible of any incidental damage, special damage, direct loss, or indirect loss (even predictable or not) sustained by the customer as a result of a faulty product.

### ■ Using the warranty service

- The customer is able to receive a warranty service during the warranty period from the product supplier or service station, if the product does not meet the specifications described in this guide.
- A fare-paying service can also be obtained by contacting your supplier, local Hitachi distributor or service station.

### ■ Precautions for product operation

- The product should be operated following the working conditions, handling methods and precautions described in User's Guide.
- Please verify that the inverter settings are adequate for operation, before operating it remotely through the network.
- Please verify that the Hitachi inverter is correctly configured and installed for the intended purpose in the designed system.
- When handling analog input/output signals, you need to use with appropriate power supply for P1-AG and its peripherals.
- When using the Hitachi inverter, please implement the following actions.
  - (1) Select an inverter with sufficient capacity for the rated current and performance.
  - (2) Implement safety design such as redundant system design.
  - (3) Implement safety design which minimizes risks in case of an inverter failure.
  - (4) Design the system in a way it can warn the operator about any danger.
  - (5) Carry out periodic maintenance to the customer's equipment as well as the inverter.
- For applications that involve human life, or have risk of an important loss, make sure to avoid a critical accident by installing a fail-safe device, protecting device, detecting device, alarm device, and/or spare device, etc.

### ■ Change on product specifications

- Please be aware that the information described in Brochure, User's Guide or Technical Document might be modified without notice.

### ■ Supplement

- This warranty term will not restrict the legal right of customer who has purchased the product.
- Please contact your sales agent for warranty of products.

### ■ Contact Information

- Hitachi America, Ltd. (Charlotte Office)  
Industrial Components and Equipment Division  
6901 Northpark Blvd., Suite A, Charlotte, NC 28216,  
U.S.A.  
TEL: +1(704) 494-3008  
FAX: +1(704) 599-4108
- Hitachi Europe GmbH  
Industrial Components & Equipment Group  
Niederlasser Lohweg191, 40547 Dusseldorf,  
Germany  
TEL: +49-211-5283-0  
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Singapore  
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## S.4 Related documents

Document Name	Document Code
P1-AG(analog input/output option) User's Guide (this document)	NT260X

Document Name (Inverter)	Document Code
SJ series P1 User's Guide	NT251 *1)
SJ series P1 Basic Guide	NT2511 *1)

\*1): It represents the version of each guide.

## S.5 Trademark

- CRIMPFOX® is a registered trademark of Phoenix Contact GmbH & Co. KG.
- Any other brand names and product names mentioned in this guide are trademarks or registered trademarks of their respective owners.

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## 1

# Chapter 1 Safety Precautions

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## 1.1 About this chapter

This chapter contains the information about Safety precautions during the installation, wiring, operation and inspection.

Before installation, wiring, operation, inspection, or usage, please read completely and fully understand this guide and other references.

## 1.2 Types of warnings

In this guide, the safety precautions as well as residual risks are categorized by degree of risk as "Danger", "Warning" and "Caution".

The definition of each category is described below.

### **Danger**


This category warns the user that in case of an incorrect or improper handling, it leads to a dangerous situation that have a high risk of causing death, serious injuries and/or major property damage.


### **Warning**

This category warns the user that in case of an incorrect or improper handling, it leads to a dangerous situation that may cause death, serious injuries and/or major property damage.

### **Caution**

This category warns the user that in case of an incorrect or improper handling, it leads to a dangerous situation that may cause physical injuries and/or property damage.

However, any content labeled with " **Caution**" and depending on the case, might have a possibility of leading to a highly dangerous situation. It is extremely important that you follow the instructions and warnings







Furthermore, content labeled with "" must be followed and paid special attention.



### 1.3 Symbol explanation

In this guide, there are some explanatory notes using different symbols. Pay attention to this content and keep in mind its information.

#### Symbol definition

	<p>When handling this product, this symbol indicates danger, warning, caution about ignition, electric shock, high temperature and others.</p> <p>Inside or near the  symbol, the specific content will be shown.</p>
	<p>This symbol indicates "General hazard not specified, be cautious".</p>
	<p>This symbol indicates "Electric shock hazard".</p>
	<p>This symbol indicates prohibited actions "Actions that should not be done" when handling this device.</p>
	<p>This symbol indicates actions that must be done based on the instructions.</p>

## 1.4 Precautions

### 1.4.1 Be careful!



## Danger



Caution

· If handled incorrectly or improperly, it might cause death, serious physical injuries, or damage to the inverter, motor or even the entire system.

· Before installation, wiring, operation, inspection, or usage, please read and fully understand this guide and other references.



Do



Caution

· In order to explain this device details the illustrations in this guide might show this device without covers.

· Before operating this device, please return all the covers to the original position, and follow all the necessary regulations and instructions written in this guide.



Do



Caution

· There will be additional warnings about hazards and failure causes in other chapters.

· Before installation, wiring, operation, inspection, or usage, please read and fully understand this guide.



Do

### 1.4.2 Precautions during the installation!



## Danger



Fire hazard

#### ● Risk of fire!

· DO NOT place inflammable objects nearby the device.

· DO NOT let scraps of wire, welding sputtering, irons scraps or other objects get inside the device.



Prohibited



Do

· Avoid installing this device in places with high temperature, high humidity, Condensation-prone conditions, dusty conditions, corrosive gas, explosive gas, flammable gas, grinding fluid mist, hydrogen sulfide or salt damage prone conditions. Additionally, it is recommended to install this device in ventilated room not exposed to direct sunlight.



Failure

#### ● Risk of an inverter failure!

· This device is a precision equipment, DO NOT drop it, or give it a strong shock.

· DO NOT get on (step on) or place heavy objects on this device.

· When handling the object, avoid places prone to static electricity(like carpets).



Do

· Since the human body can get charged with static electricity, as a safety measure, please touch a safe metallic surface before handling this device.



Injury

#### ● Risk of injury!

· DO NOT install or operate products with damage or missing parts.



Prohibited

## 1.4.3 Precautions during the wiring!

**Danger****Electric shock and fire hazard****Do**● **Risk of an electric shock and/or fire!**

- Be sure to ground the inverter.
- Entrust the wiring work only to a qualified electrician.
- Before the wiring work, be sure to turn off the power supply and wait for more than 10 or 15 minutes depending on the inverter model \*1). (Confirm that the charge lamp is OFF and the DC voltage between terminals P and N is 45 V or less.)

**Failure****Prohibited**● **Risk of inverter failure!**

- Do not pull any wire after wiring.

**Electric shock and injury****Do**● **Risk of an electric shock and/or injury!**

- Perform the wiring only after installing the inverter.

\*1): For P1-00044-L to P1-01240-L (P1-004L to P1-220L), P1-00041-H to P1-00620-H (P1-007H to P1-220H) models the wait time is 10 minutes.  
For P1-01530-L to P1-02950-L (P1-300L to P1-550L), P1-00770-H to P1-05200-H (P1-300H to P1-2200H) models the wait time is 15 minutes.

**Warning****Electric shock and injury****Prohibited**● **Risk of an electric shock and/or injury!**

- DO NOT operate/switch any of the switches from the 4 pole DIP switch \*2) on this device. When this device is shipped all switches are turned off.
- If any of the switches from the 4 pole DIP switch \*2) is operated/switched, this device will not work as intended and it might be the cause of failure.
- Please handle the cables properly and DO NOT let them get damaged. Using damaged cables will not only interfere with the correct operation of this device but also might be the cause of a system failure.

**Do****Fire hazard****Do**● **Risk of fire!**

- Tighten the screws and bolts with the specified torque. (Please refer to the inverter user's guide).
- Verify that none of the screws and bolts are loose.
- Make sure that the inverter and this device are fixed together with the securing screw.
- Make sure that the connectors are properly fixed.

\*2): 4 pole DIP switch is implemented on the board exposed from the case of this product.

## 1.4.4 Precautions during operation!

 **Danger**


## ● Risk of an electric shock or fire!

**Electric shock and fire hazard**

- DO NOT touch the inside of this device, check the signal, do any wiring or plug/unplug the connectors while it energized.



**Prohibited**

- DO NOT insert any stick or rod like objects inside this device while it is energized.



## ● Risk of an electric shock!

**Electric shock**

- Be sure to fasten all the screws of this device before turning it on. DO NOT detach this device while it is energized or the inverter capacitors are still charged. Additionally, DO NOT touch the inside of the inverter while the inverter capacitors are still charged.



**Prohibited**

- DO NOT touch this device with wet hands.



## ● Risk of an injury and/or fire!

**Injury and fire hazard**

- DO NOT touch the inside of this device or the inverter while they are energized.



**Prohibited**

 **Warning**


## ● Risk of injury and/or device damage!

**Injury or device damage**

- By using this device it becomes easier to change the settings and the output frequency of the inverter. When changing the settings or the output frequency of the inverter, make sure that it is within the supported range by the motor and/or the equipment.



**Do**

- In case the inverter is operating the motor at high frequencies, make sure with the respective manufacturer that the motor and the equipment can tolerate the high frequency output given by the inverter.
- During operation verify the motor rotation direction, and that there are no irregular sounds or vibrations.

## 1.4.5 Precautions during maintenance/inspection!

 **Danger**


## ● Risk of an electric shock!

Electric shock

· Before the wiring work, be sure to turn off the power supply and wait for more than 10 or 15 minutes depending on the inverter model \*1). (Confirm that the charge lamp is OFF and the DC voltage between terminals P and N is 45 V or less.)



Do



Prohibited

· Entrust the maintenance, inspection and/or part replacement only to a specialized personnel. (Be sure to remove wristwatches and metal accessories, e.g., bracelets, before maintenance and inspection work and use insulated tools for the work).

\*1): For P1-00044-L to P1-01240-L (P1-004L to P1-220L), P1-00041-H to P1-00620-H (P1-007H to P1-220H) models the wait time is 10 minutes.

For P1-01530-L to P1-02950-L (P1-300L to P1-550L), P1-00770-H to P1-05200-H (P1-300H to P1-2200H) models the wait time is 15 minutes.

## 1.4.6 Precautions for disposal!

 **Danger**

## ● Risk of injury and/or an explosion!



Injury and explosion hazard

· For disposal of this device, outsource to a qualified industrial waste disposal contractor. Disposing this device on your own may result in the production of poisonous gas.



Do

· Contact Hitachi technical service or your sales agent if you need to get this device fixed.

· A qualified waste disposer includes industrial waste collector/transporter and industrial waste disposal operator. Follow all laws and decrees related to procedures of waste management and public cleansing when disposing of this device.

## 1.4.7 Other precautions

**Danger**

Electric shock injury and fire hazard

## ● Risk of an injury, an electric shock and/or fire!

· Do NOT modify this device.



Prohibited

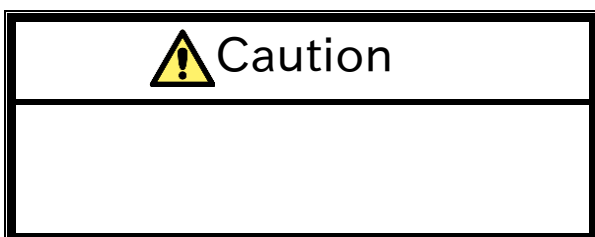
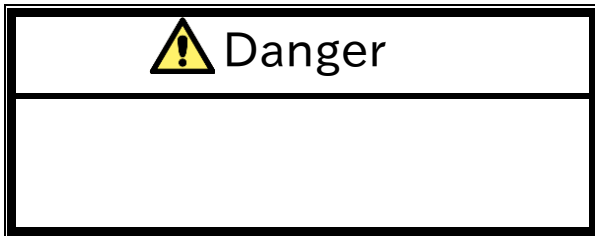
※In addition to the precautions described above, there are other precautions described in the chapter 8 of the inverter user's guide. Please read and follow those precautions as well.

### 1.5 Caution labels examples

- We include the caution label templates so motor, inverter or system related accidents or dangerous situations may be prevented. Please use these labels for your system or equipment.
- When the inverter is configured for remote operation, automatic operation or the retry function is active, there are cases when the operation will be resumed automatically after a shut down. In order to warn about this cases please use the label example on the right side as a reference.

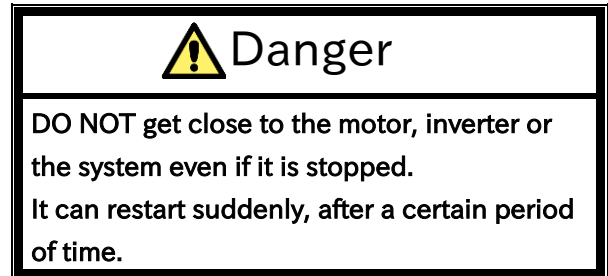
(Label template)

- Please fill in the label and use it for preventing accidents.



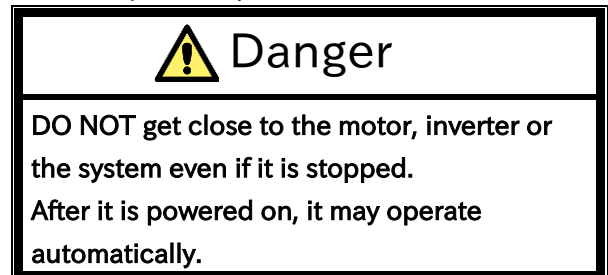
(Label example)

- For warning about automatically resumed operation after an error as a result of the retry function.



(Label example)

- For warning about remote or automatic operation after the system is powered on.



(Memo)

# 2

## Chapter 2 Overview

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### 2.1 About this chapter

This chapter specifies the devices that this guide will describe. Additionally, it contains information necessary to clearly understand this guide, the objectives of this guide and its terminology.

### 2.2 Applicable devices

The contents of this guide will apply to the P1-AG device. For information about the inverter, please refer to the inverter's user's guide or the basic guide.

### 2.3 Before reading this guide

This guide is aimed for people who purchase, handle, install or connect control equipment, design systems or manage factories.

This guide units are based on the SI system.

### 2.4 Guide objectives

The objectives of this guide are:

- explain how to wire and connect the device.
- explain how to configure the device.



## 2.5 Guide outline

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This guide has the following structure.

- **The chapter 1: Safety Precautions**  
"Safety Precautions" contains the safety instructions for installing, wiring, operating, maintaining and inspecting this device.
- **The chapter 2: Overview**  
"Overview" contains information necessary to clearly understand this guide.
- **The chapter 3: About the P1-AG**  
"About the P1-AG" contains the explanation about this device appearance and general features.
- **The chapter 4: Enclosed Items**  
"Enclosed Items" contains information about the items included with this device.
- **The chapter 5:  
Installation and Wiring**  
"Installation and Wiring" contains information for installing and wiring this device on the inverter.
- **The chapter 6:  
Function of Analog Input/Output**  
"Function of Analog Input/Output" contains the explanation of the inverter parameters that relate with this device.
- **Chapter 7: FAQ and Troubleshooting**  
"FAQ and Troubleshooting" contains the explanation of inverter error (trip) status and its trouble shooting while in use this device.
- **Chapter 8: Specifications**  
"Specifications" contains the specifications of this device.



# Chapter 3 About the P1-AG

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## Contents

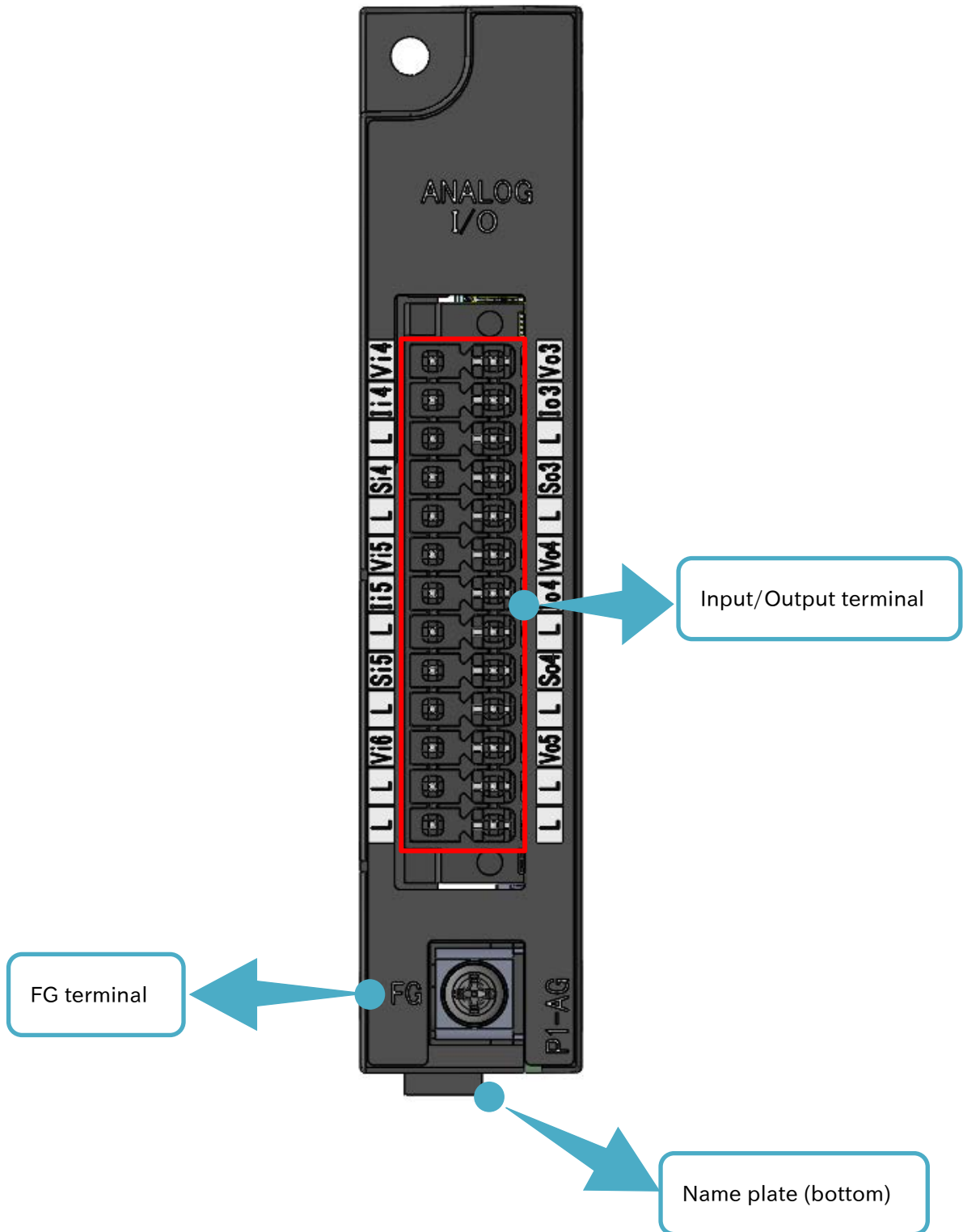
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## 3.1 About this chapter

This chapter contains the explanation about this device external features and information on the name plate.

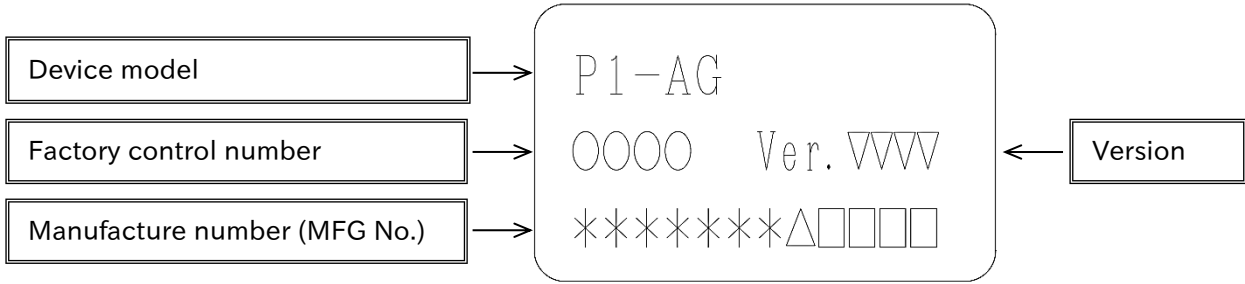
### 3.2 P1-AG appearance and nomenclature

An external view of this device is shown below. For installing this device or details of LEDs, connectors and other parts refer to the chapter 5 "Installation and Wiring".



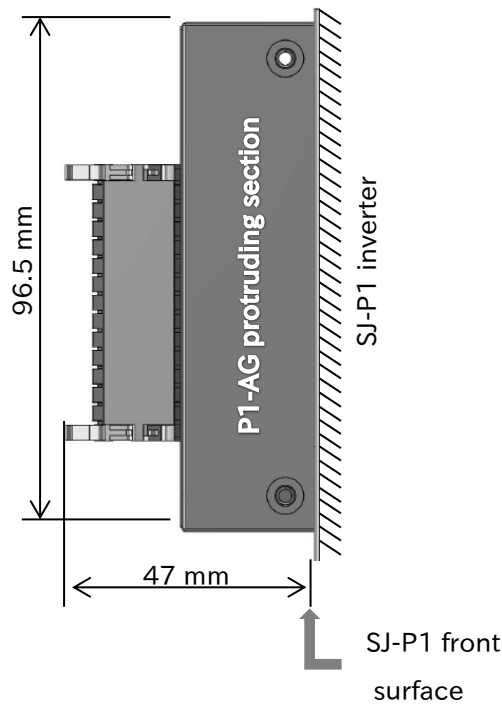
### 3.3 Name plate

The P1-AG name plate gives the following information.



### 3.4 Dimensions after installed

The dimensions of this device after it is installed on the SJ-P1 are shown in the image below. As shown on the image a part of this device will stand out from the SJ-P1. Please be cautious when installing the P1-AG.



View from the right side of the SJ-P1.

(Memo)



# Chapter 4 Enclosed Items

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## 4.1 About this chapter

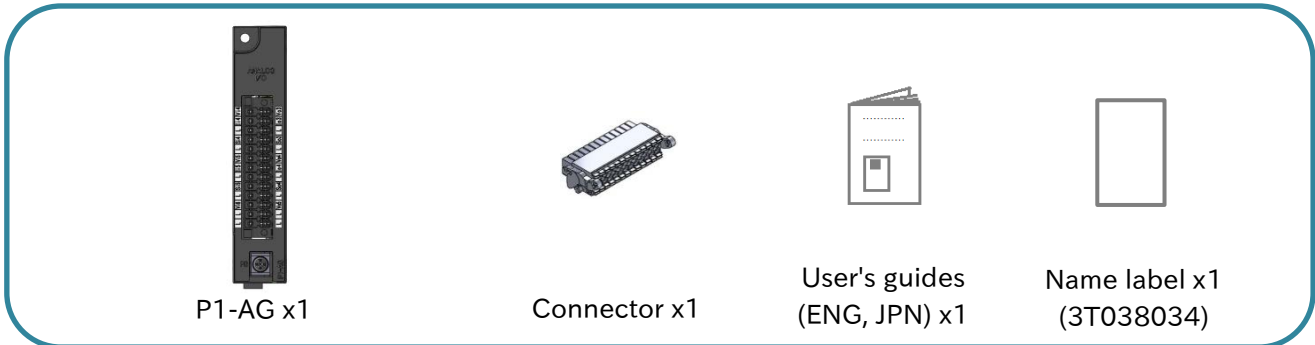
This chapter contains information about the items enclosed with the P1-AG. Additionally, it is explained how to inspect and verify this product after its purchase.

## 4.2 About the enclosed items

The enclosed items are shown on the images below.

Contact your sales agent immediately in case there are defects or imperfections.

### Enclosed items



## 4.3 Verification after the purchase

Please verify the following contents after the purchase.

### 4.3.1 Verification when unpacking

- Please verify the items written on the right when unpacking.
- In case there is any doubt or trouble with the product please contact your sales agent as soon as possible.

✓ Check that the items were not smashed or damaged during the delivery.

Check that  
 ✓ there is a P1-AG,  
 ✓ there is a connector,  
 there are two User's Guides(ENG, JPN),  
 there is a name label,  
 when unpacking.

✓ Please check again that your order match with the name plate of this device.

### 4.3.2 Read this guide

- This guide contains the information necessary to handle the P1-AG correctly. Read it carefully and keep it safe.
- Also, use the inverter user's guide and basic guide as a reference.
- Please make sure that the inverter basic guide reach the end user. Additionally, advise the end user to download and read the latest version of the inverter User's guide.



# Chapter 5 Installation and Wiring

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## 5.1 About this chapter

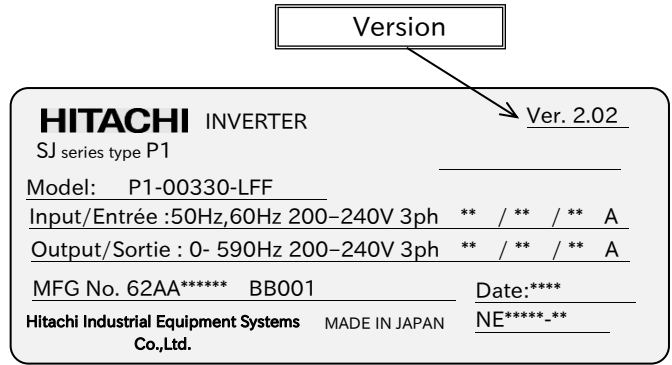
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This chapter contains information for installing and wiring this device on the inverter. For information about the inverter installation, please refer to the inverter user's guide. Additionally, when doing any work or operation, always follow the safety instructions and cautions given in the chapter 1.



### 5.2 Supported inverters

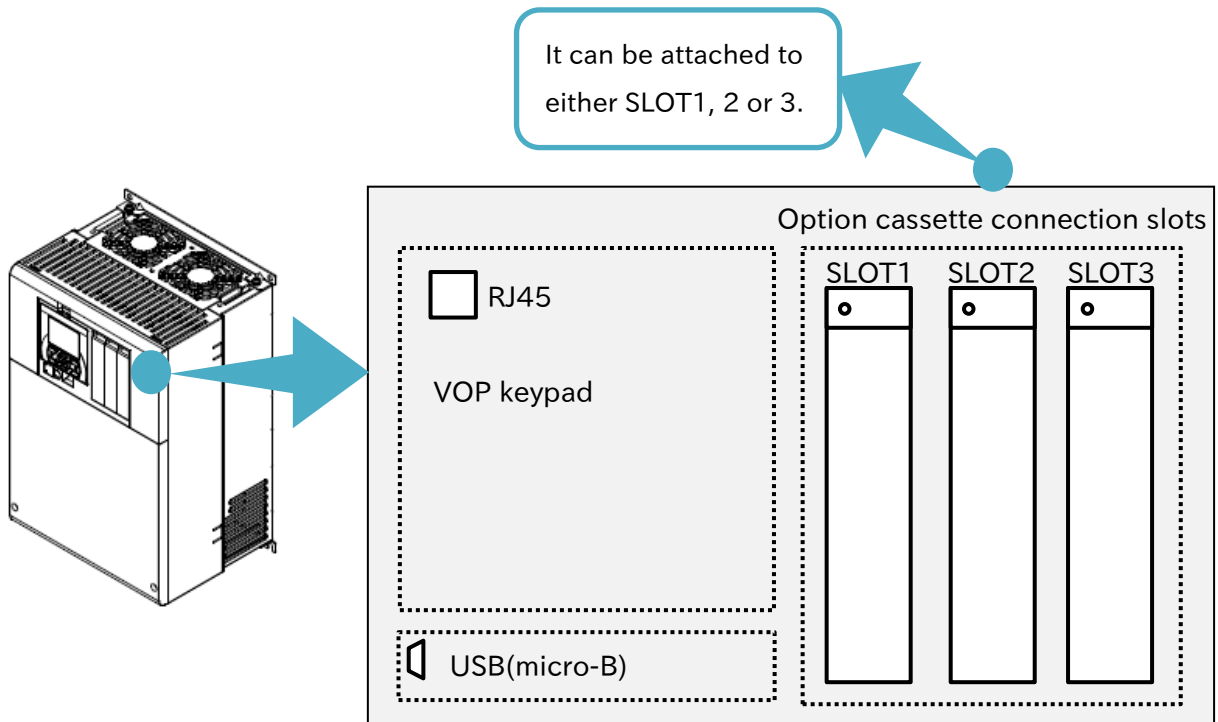
The P1-AG can be attached to all types of SJ-P1. However, depending on the SJ-P1 manufacture date, it might not support the P1-AG. Please check the version of the inverter which is written on the name plate of it (the name plate example is shown on the image to the right.) If the version is 2.02 or higher it can support the P1-AG.



### 5.3 Installation

#### 5.3.1 About the installation

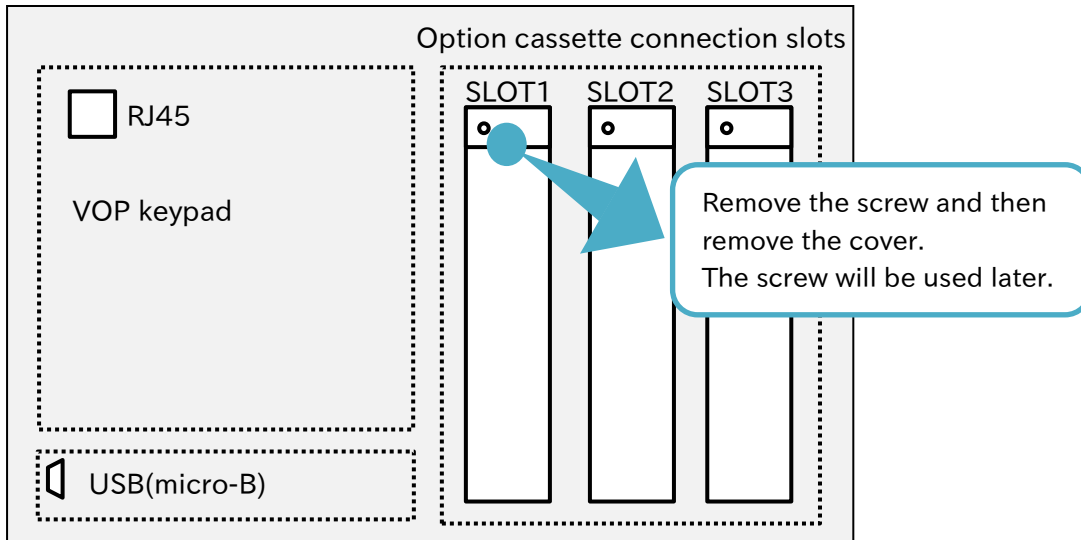
The P1-AG can be attached to any of the 3 option slots of the SJ-P1.



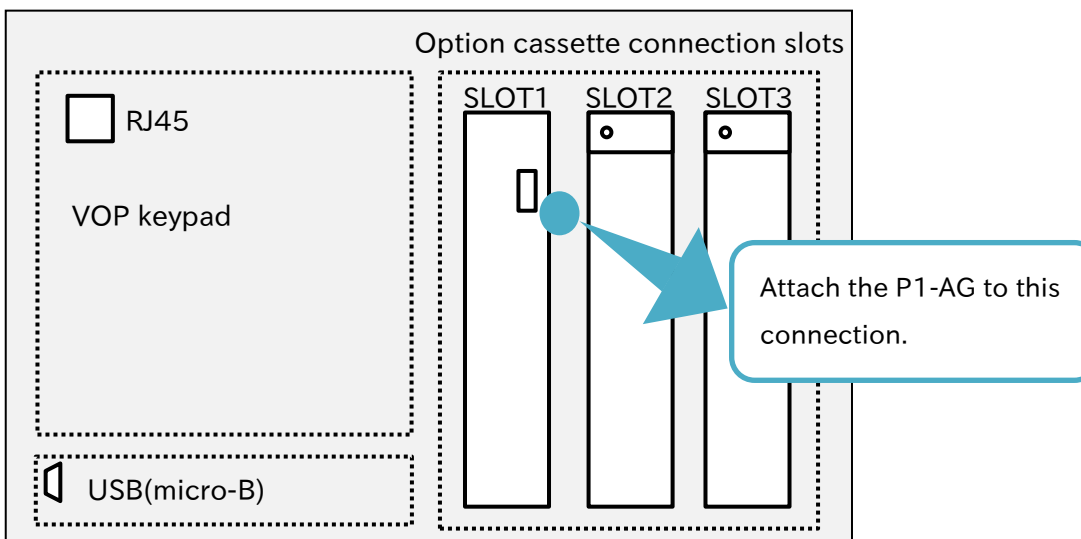
### 5.3.2 How to install

For explanation purposes, it will be assumed that the P1-AG is going to be installed in the SLOT1.

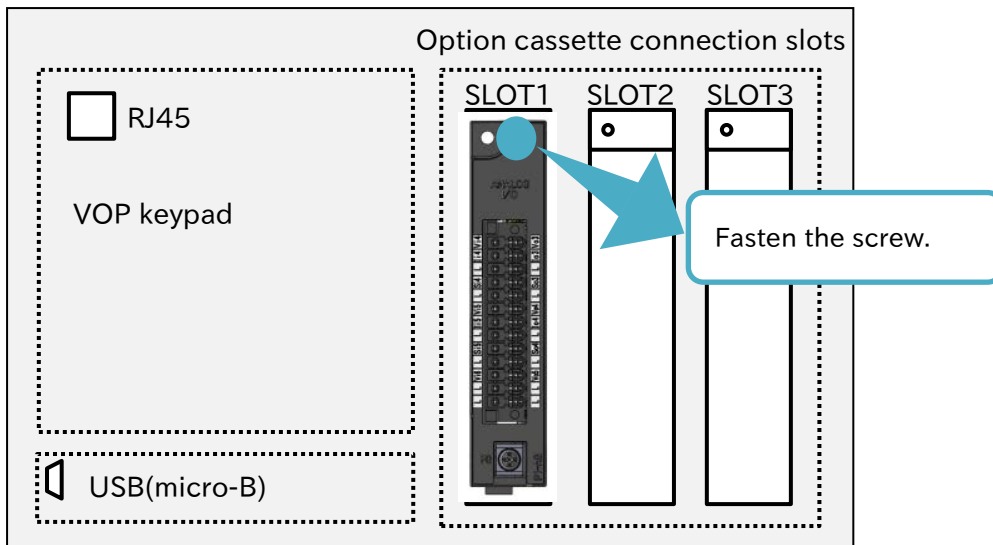
- (1) Remove the cover of the option cassette connection slot. Despite the removed cover will no longer be needed, it is recommended to keep it in a safe place. However the screw that secured the cover will be used to secure the P1-AG.



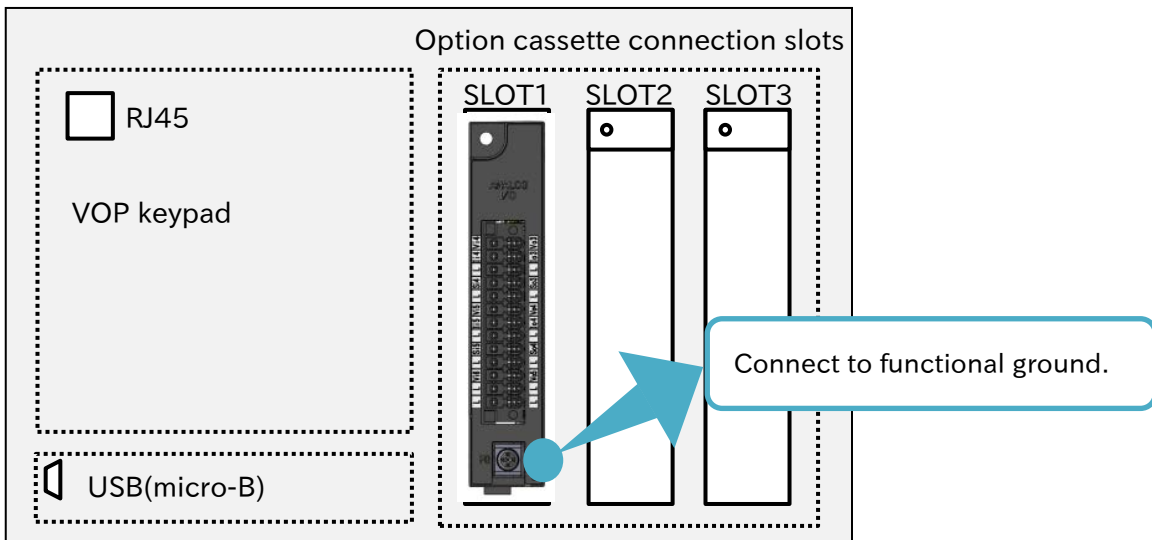
- (2) Attach this device. The slots 2 and 3 have one more connection in the lower side. However, the P1-AG will not need that connection.



- (3) Secure the P1-AG with the screw removed in procedure (1).



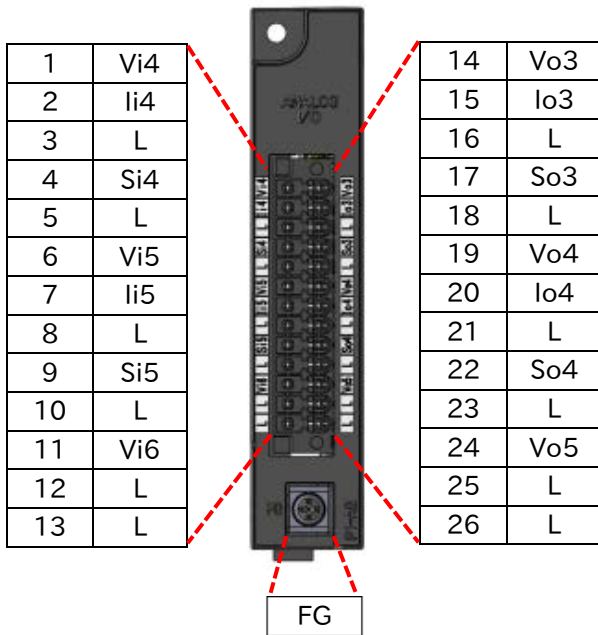
- (4) Connect the FG terminal to functional ground.



### 5.4 Terminal block and wiring

Terminal arrangement, symbols and specifications of P1-AG are shown the followings.

■ Terminal arrangement



■ Terminal specifications

Terminal Name	Symbol	Description	Electrical Characteristic
Analog Input	Vi4	Voltage input 4: 0 to 10V	Input impedance: 10kΩ (approximately) Allowable range of input: -0.3 to 12V
	Ii4	Current input 4: 0 to 20mA	Input impedance: 100Ω (approximately) Allowable range of input: 0 to 24mA
	Si4	Select input 4: voltage or current	Shorted Si4 to L: Vi4 enabled (initial condition) Opened Si4: Ii4 enabled
	Vi5	Voltage input 5: 0 to 10V	Input impedance: 10kΩ (approximately) Allowable range of input: -0.3 to 12V
	Ii5	Current input 5: 0 to 20mA	Input impedance: 100Ω (approximately) Allowable range of input: 0 to 24mA
	Si5	Select input 5: voltage or current	Shorted Si5 to L: Vi5 enabled (initial condition) Opened Si5: Ii5 enabled
Analog Input Terminal 6	Vi6	Voltage 6: -10 to 10V	Input impedance: 10kΩ (approximately), allowable range of input: -12 to 12V
Analog Output	Vo3	Voltage output 3: 0 to 10V	Maximum output current: 2mA Allowable range: 0 to 10V (±10% accuracy)
	Io3	Current output 3: 0 to 20mA	Allowable load impedance: 250Ω or less Allowable range: 0 to 20mA (±20% accuracy)
	So3	Select output 3: voltage or current	Shorted So3 to L: Vo3 enabled (initial condition) Opened So3: Io3 enabled
	Vo4	Voltage: 0 to 10V	Maximum output current: 2mA Allowable range: 0 to 10V (±10% accuracy)
	Io4	Current: 0 to 20mA	Allowable load impedance: 250Ω or less Allowable range: 0 to 20mA (±20% accuracy)
	So4	Select output 4: voltage or current	Shorted So4 to L: Vo4 enabled (initial condition) Opened So4: Io4 enabled
Analog Output Terminal 5	Vo5	Voltage output 5: -10 to 10V	Maximum output current: ±2mA Allowable range: -10 to 10V (±10% accuracy)
Input/Output Common	L	Reference potential (signal ground)	
Functional Ground	FG	Connect to the functional ground (the screw size: M3)	

It cannot work the following terminal combinations simultaneously.

- Combination of Vi4 and Ii4 terminal
- Combination of Vi5 and Ii5 terminal

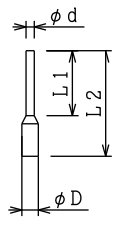
Besides, redundant terminals need to be opened, do not wire or connect them.

- Combination of Vo3 and Io3 terminal
- Combination of Vo4 and Io4 terminal

■ Recommendation terminals

In order to make convenience to wiring and improve the connection, it's recommended to use the ferrule terminals with the following specifications for signal wire.

Note that these specifications are different from the recommended ferrule terminals for the inverter.

Wire diameter [mm <sup>2</sup> ] (AWG)	Ferrule terminal model *1)	L1[mm]	L2[mm]	φ d[mm]	φ D[mm]	
0.25 (24)	AI 0,25-10 YE	10.0	14.5	0.8	2.0	
0.34 (22)	AI 0,34-10 TQ	10.0	14.5	0.8	2.0	
0.5 (20)	AI 0,5-10 WH	10.0	16.0	1.1	2.5	
0.75 (18)	AI 0,75-10 GY	10.0	16.0	1.3	3.4	

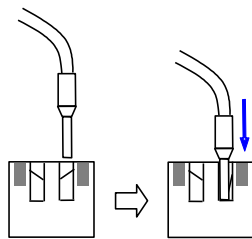
\*1): Manufacturer: PHOENIX CONTACT GmbH & Co. KG

Crimping tool: CRIMPFOX® 6

■ Wiring

Inserting the wire:

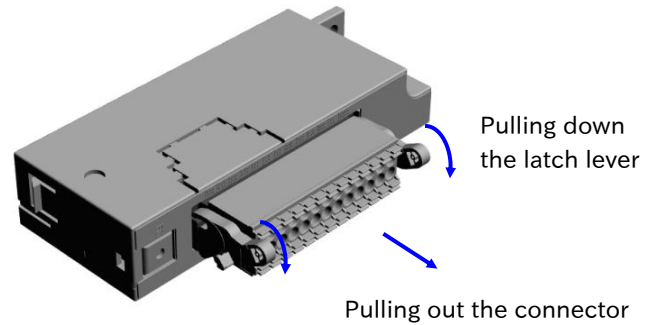
- ① Inserting the ferrule terminal into the P1-AG connector. It will be easy to insert without any tools if use the recommendation ferrule terminals. \*2)



Inserting wire

■ Detaching the connector

Pulling down the latch lever in the arrow direction as shown below, then pulling out the connector.



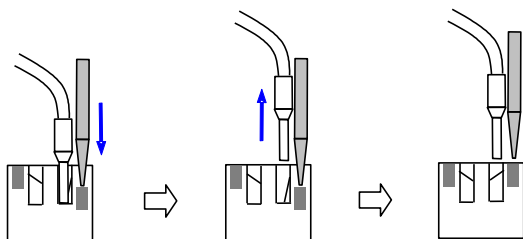
Pulling down the latch lever

Pulling out the connector

\*2): In case not using the recommendation ferrule terminal, please insert it with a flat head screwdriver in the reverse order of removal method.

Pulling out the wire:

- ① Pressing the grey part \*3) on P1-AG connector with flat screwdriver (width 2.5mm or less) to open the wire port.
- ② Pulling out the wire or the ferrule terminal while pressing the flat screwdriver.
- ③ Pulling out the flat screwdriver.



Pressing the grey part \*3) with flat screwdriver

Pulling out the wire or the ferrule terminal

Pulling out the flat screwdriver

\*3): It is orange of the actual color that grey part on the connector.

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# Chapter 6 Function of Analog Input/Output

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## Contents

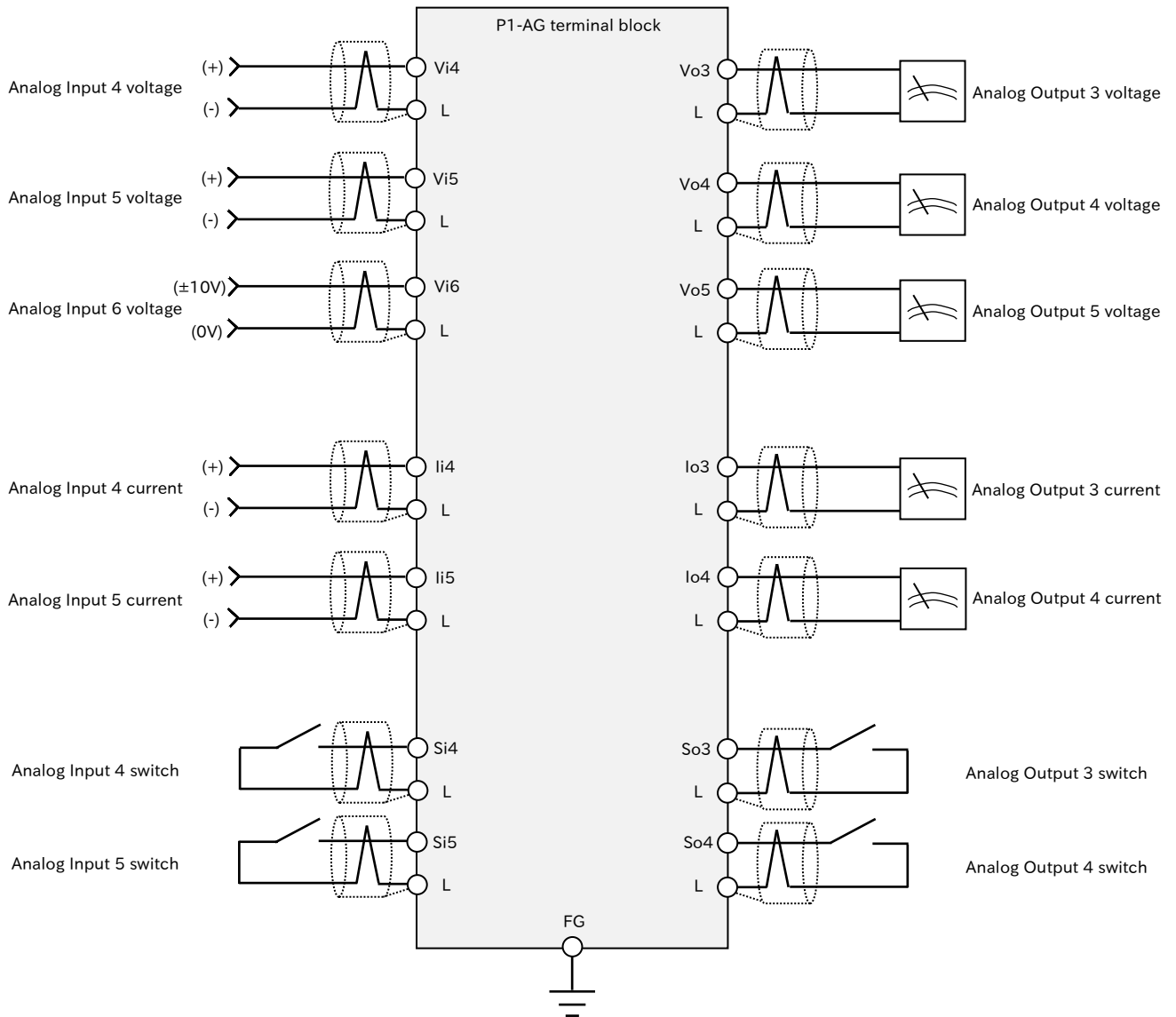
6.1 About this chapter.....	6-1
6.2 An example of terminal connection.....	6-2
6.3 List of parameters related to the P1-AG.....	6-3

## 6.1 About this chapter

This chapter contains the information about the inverter setting parameters related to this product.

## 6.2 An example of terminal connection

An example of terminal connection of P1-AG is as follows.



- Wiring the P1-AG, make sure that use the twisted pair cable with shield. In case of improper wiring, the inverter may malfunction caused by external noise. Make sure that the shield is wired to L terminal or Ground terminal of the inverter. Additionally, do not be multipoint ground.
- Make sure that length of wiring to P1-AG must be 20 m or less. In case the length is more than 20 m, the inverter may malfunction caused by external noise.
- Make sure of wiring the FG terminal to functional ground.

### 6.3 List of parameters

#### related to the P1-AG

The following table shows the inverter setting parameters related to this product. For information about actual usage, please refer to the SJ-P1 User's guide.

#### ■ Parameter

Code	Parameter name
dA-60	Analog input/output status monitor
dA-64	Analog input [Ai4] monitor
dA-65	Analog input [Ai5] monitor
dA-66	Analog input [Ai6] monitor
dA-81	Option slot-1 status
dA-82	Option slot-2 status
dA-83	Option slot-3 status
db-21	Analog output monitor YA3
db-22	Analog output monitor YA4
db-23	Analog output monitor YA5
AA101	Main speed input source selection, 1st-motor
AA201	Main speed input source selection, 2nd-motor
AA102	Sub speed input source selection, 1st-motor
AA202	Sub speed input source selection, 2nd-motor
Ad-01	Torque reference input source selection
Ad-11	Torque bias input source selection
Ad-40	Speed limit input source selection at torque control
AH-07	PID1 set-point 1 input source selection
AH-42	PID1 set-point 2 input source selection
AH-46	PID1 set-point 3 input source selection
AH-51	PID1 feedback 1 input source selection
AH-52	PID1 feedback 2 input source selection
AH-53	PID1 feedback 3 input source selection
AH-70	PID1 feed-forward input source selection
AJ-07	PID2 set-point input source selection
AJ-12	PID2 feedback input source selection
AJ-27	PID3 set-point input source selection
AJ-32	PID3 feedback input source selection
AJ-47	PID4 set-point input source selection
AJ-52	PID4 feedback input source selection

Code	Parameter name
bA101	Upper frequency limit source selection, 1st-motor
bA201	Upper frequency limit source selection, 2nd-motor
bA110	Torque limit selection, 1st-motor
bA210	Torque limit selection, 2nd-motor
CA-70	Speed command selection when [F-OP] is active
CC-01	Output terminal [11] function
CC-02	Output terminal [12] function
CC-03	Output terminal [13] function
CC-04	Output terminal [14] function
CC-05	Output terminal [15] function
CC-06	Output terminal [16] function
CC-07	Output terminal [AL] function
oA-10	Operation selection at an option error (SLOT-1)
oA-20	Operation selection at an option error (SLOT-2)
oA-30	Operation selection at an option error (SLOT-3)
oE-01	[Ai4] Filter time constant
oE-03	[Ai4] Start value
oE-04	[Ai4] End value
oE-05	[Ai4] Start rate
oE-06	[Ai4] End rate
oE-07	[Ai4] Start point selection
oE-11	[Ai5] Filter time constant
oE-13	[Ai5] Start value
oE-14	[Ai5] End value
oE-15	[Ai5] Start rate
oE-16	[Ai5] End rate
oE-17	[Ai5] Start point selection



Code	Parameter name
oE-21	[Ai6] Filter time constant
oE-23	[Ai6] Start value
oE-24	[Ai6] End value
oE-25	[Ai6] Start rate
oE-26	[Ai6] End rate
oE-28	[Ai4] Voltage/Current bias adjustment
oE-29	[Ai4] Voltage/Current gain adjustment
oE-30	[Ai5] Voltage/Current bias adjustment
oE-31	[Ai5] Voltage/Current gain adjustment
oE-32	[Ai6] Voltage bias adjustment
oE-33	[Ai6] Voltage gain adjustment
oE-35	[Ai4] Window comparator upper limit
oE-36	[Ai4] Window comparator lower limit
oE-37	[Ai4] Window comparator hysteresis width
oE-38	[Ai5] Window comparator upper limit
oE-39	[Ai5] Window comparator lower limit
oE-40	[Ai5] Window comparator hysteresis width
oE-41	[Ai6] Window comparator upper limit
oE-42	[Ai6] Window comparator lower limit
oE-43	[Ai6] Window comparator hysteresis width
oE-44	[Ai4] Temporal operation level set at disconnection or compare event
oE-45	[Ai4] Temporal operation level implementation timing
oE-46	[Ai5] Temporal operation level set at disconnection or compare event
oE-47	[Ai5] Temporal operation level implementation timing
oE-48	[Ai6] Temporal operation level set at disconnection or compare event
oE-49	[Ai6] Temporal operation level implementation timing
oE-50	[Ao3] Output monitor selection
oE-51	[Ao4] Output monitor selection
oE-52	[Ao5] Output monitor selection

Code	Parameter name
oE-56	[Ao3] Output filter time constant
oE-57	[Ao3] Data type selection
oE-58	[Ao3] Bias adjustment
oE-59	[Ao3] Gain adjustment
oE-60	Adjustment mode [Ao3] output level
oE-61	[Ao4] Output filter time constant
oE-62	[Ao4] Data type selection
oE-63	[Ao4] Bias adjustment
oE-64	[Ao4] Gain adjustment
oE-65	Adjustment mode [Ao4] output level
oE-66	[Ao5] Output filter time constant
oE-67	[Ao5] Data type selection
oE-68	[Ao5] Bias adjustment
oE-69	[Ao5] Gain adjustment
oE-70	Adjustment mode [Ao5] output level
PA-22	Simulation mode: Optional output selection for the output current monitor
PA-24	Simulation mode: Optional output selection for the DC bus voltage monitor
PA-26	Simulation mode: Optional output selection for the output voltage monitor
PA-28	Simulation mode: Optional output selection for the output torque monitor
PA-30	Simulation mode: Optional frequency matching start enable setting



# Chapter 7 FAQ and Troubleshooting

## Contents


7.1 About this chapter..... 7-1  
 7.2 Self-diagnosis ..... 7-1  
 7.3 Inverter troubleshooting..... 7-2  
 7.4 Any other troubles..... 7-3

## 7.1 About this chapter

This chapter contains the troubleshooting of cases such as errors detected by the protection function, warnings given by the warning function, or some cases in which the device is not working properly. When the device is not working properly or there is any trouble, read this chapter before trying to solve the problem. Use the following sections as a reference when dealing with these situations.

## 7.2 Self-diagnosis

The inverter tripped.

 It is displaying an error.  
 Refer to this guide page 7-2  
 "7.3 Inverter troubleshooting"



Please contact your supplier or Hitachi inverter technical service office.

Before contacting the technical service, confirm the following items.

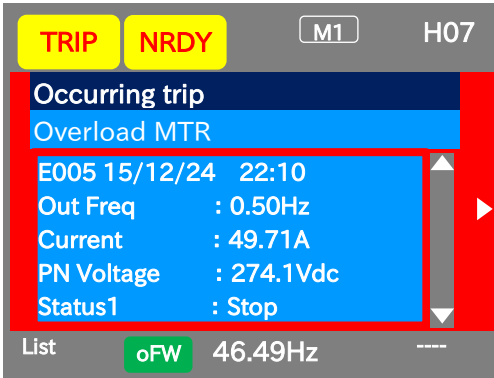
- (1) Inverter model
- (2) Inverter manufacture number (MFG No.)
- (3) Option device model (P1-AG)
- (4) Option manufacture number (MFG No.)
- (5) Date of purchase
- (6) Inquiry contents

For information about how to check the (1) and (2) refer to the inverter user's guide.

For information about how to check the (3) and (4) refer to the chapter 3 in this guide.

### 7.3 Inverter troubleshooting

In case the some error was detected by the inverter, it stops the motor (trip) and gives a notice with the respective error code. When the trip occurs, the inverter display (VOP) shows following screen.



The number of E005 in the above is an error code. Abnormality related to this device and its solutions are shown the following.

■ Abnormality and its solutions related with this product.

#### E060 / E069

#### Option 1 Error 0 / 9

#### E070 / E079

#### Option 2 Error 0 / 9

#### E080 / E089

#### Option 3 Error 0 / 9

When a communication error occurring between the P1-AG and the inverter, the inverter trips with those codes.



In case the communication error detected by the P1-AG, "E060, E070, or E080" is shown as the error code. Additionally, in case the communication error detected by the inverter, "E069, E079, or E089" is shown as the error code. Those error codes "E06\*", E07\*", or E08\*" depend on the slot in which the P1-AG is attached.

Issue▶	Possible cause▶	Possible solution
An error occurred in the communication between the P1-AG and the inverter.	<ul style="list-style-type: none"> <li>• The P1-AG is not correctly attached.</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to the chapter 5.3 "Installation", attach the P1-AG again.</li> </ul>
	<ul style="list-style-type: none"> <li>• There is an intruding object in between the P1-AG and the inverter connector.</li> </ul>	<ul style="list-style-type: none"> <li>• Remove the intruding object.</li> </ul>

**E068 Option 1 Error 8**  
**E078 Option 2 Error 8**  
**E088 Option 3 Error 8**



In case the P1-AG is attached to the unsupported inverter, "E068, E078, or E088" is shown as the error code.

Those error codes "E06\*", E07\*", or E08\*" depend on the slot in which the P1-AG is attached.

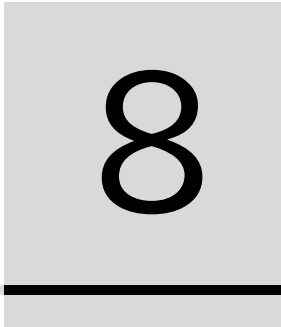
Issue▶	Possible cause▶	Possible solution
An error occurred as soon as the inverter powered on.	<ul style="list-style-type: none"> <li>• The P1-AG is attached to the unsupported inverter.</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to the chapter 5.2 "Supported inverters", attach the P1-AG to the supported inverter.</li> </ul>

**7.4 Any other troubles**

In case the P1-AG does not work properly without any error codes of the inverter, refer to the following solutions.

Issue▶	Possible cause▶	Possible solution
The function of analog input/output does not work properly.	<ul style="list-style-type: none"> <li>• The P1-AG is not correctly attached.</li> </ul>	<ul style="list-style-type: none"> <li>• When a communication error occurring between the P1-AG and the inverter, the P1-AG outputs 0V or 0mA in analog output terminals. Refer to the chapter 5.3 "Installation", attach the P1-AG again.</li> </ul>
	<ul style="list-style-type: none"> <li>• There is something wrong with the wiring.</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to the chapter 5.4 "Terminal Block and Wiring", wire the P1-AG again.</li> </ul>

(Memo)



# Chapter 8 Specifications

## Contents

8.1 About this chapter.....	8-1
8.2 Device Specifications .....	8-2

## 8.1 About this chapter

This chapter contains information about the P1-AG specifications.

## 8.2 Device Specifications

Specifications of P1-AG are shown the following table.

When handling analog input/output signals, you need to use appropriate power supply for P1-AG and its peripherals.

### ■ Specifications

Item		Specification	
Model		P1-AG	
Weight		170 g	
Environment	Ambient operating temperature	-10 to 50°C	No icing or condensation conditions.
	Ambient operating humidity	20 to 90%RH	
	Storage temperature *1)	-20 to 65°C	
	Vibration resistance	5.9 m/s <sup>2</sup> (0.6G), 10 to 55 Hz	
	Conformance to EMC and electrical safety standards	IEC/EN61800-3 Second environment, Category C3 IEC/EN61800-5-1 SELV	
	Enclosure rating	IP00	
Interface	Analog input	-10 to 10 V voltage input: 1 terminal	
		0 to 10 V voltage input: 2 terminals	
		0 to 20 mA current input: 2 terminals	
	Analog output	-10 to 10 V voltage output: one terminal	
		0 to 10 V voltage output: 2 terminals 0 to 20 mA current output: 2 terminals	
Analog input/output switch	0 to 10 V voltage/0 to 20 mA current input: 2 terminals 0 to 10 V voltage/0 to 20 mA current output: 2 terminals		
Analog ground common	Reference potential(signal ground): 12 terminals		

\*1): "Storage temperature" is the temperature during transportation.