MiSUMi

PULSE TRAIN DRIVER

P 1

User's Manual

RS1 / RS2 / RS3
RS1C / RS2C / RS3C
RSD1 / RSD2 / RSD3
RSDG1 / RSDG2 / RSDG3

Ver. 2.01

EUMC20C201
KE4

CONTENTS

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Important information before reading this manual

Contents

Introduction

Thank you for purchasing the P1 Robot Driver for RS/RSD/RSDG series (hereafter referred to as "P1").
Please read this manual carefully to ensure correct and safe use of this driver.

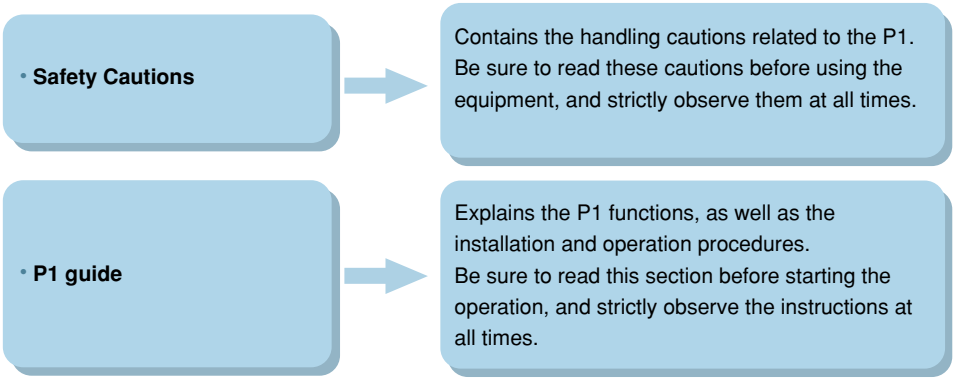
Main functions

Function	Explanation
Pulse train operation	The P1 is applicable to either the open collector methods or line driver methods according to the signal connections. So, select appropriate specifications suitable for the host unit.
Origin search	Performs an origin search (return-to-origin) simply by entering a return-to-origin command.
JOG operation	Robot JOG operation can be performed from the PC support software (RS-Manager).
Output function	The following statuses can be output to the host unit. Origin return completion status, servo status, positioning completion, alarm
Alarm history	Saves up to 50 of the most recent alarms. Additionally, the alarm occurrence status (position and input/output information, etc.) can be read.
Daisy chain	Up to 16 P1 drivers can be connected in a daisy chain.
Support tools	■ PC support software RS-Manager (Compliant version is 1.3.0 or higher.) This support software fully utilizes the operability of Windows to efficiently perform the JOG operation, return-to-origin, parameter setting, debugging, maintenance, and management. A trace function that graphically displays the internal information about the P1 and an operation simulator are incorporated into this support software. For details about the RS-Manager, see the separate user's manual for RS-Manager.

About this manual

This manual is divided into two main parts: Safety Cautions and P1 guide.
In order to use the P1 and optional devices in an efficient manner, users should read the parts which are pertinent to the objective in question. Moreover, after reading this manual, keep it on hand for easy referencing as needed, and always make it available to the end user.

Configuration of this manual



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Use any of the following methods for referencing this manual content during P1 installation, operation, and adjustment procedures.

- **Keep this manual close at hand for referencing when performing installation, operation, and adjustments.**
- **Display the CD-ROM version of this manual onscreen for referencing when performing installation, operation, and adjustments.**
- **Print out the required pages of this manual from the CD-ROM in advance, and use them for reference when performing installation, operation, and adjustments.**

Although every effort was made to ensure that this manual content is accurate and complete, please contact MISUMI if errors, misprints, or omissions are found.
For information related to the robot unit, support software, and other optional devices, please refer to the operation manuals for those items.

Safety alert symbols and signal words

The following safety alert symbols and signal words are used in this manual to describe safety concerns, handling precautions, prohibited or mandatory action and key points when using this product. Make sure you fully understand the meaning of each symbol and signal word and comply with the instructions.

DANGER

"DANGER" INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

WARNING

"WARNING" INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

CAUTION

"CAUTION" indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or damage to the equipment or software.

Indicates a prohibited action related to the handling of this product. Read the content carefully to ensure that the prohibited action is not performed.

[Example] 

Indicates a mandatory action related to the handling of this product. Read the content carefully to ensure that the mandatory action is performed.

[Example] 
Mandatory action


Cut off power

CE marking

1. Safety standard

■ Cautions regarding compliance with EC Directives

The MISUMI robot (robot and driver) is not, in itself, a robot system. The MISUMI robot is just one component that is incorporated into the customer's system (built-in equipment), and MISUMI robots are in compliance with the EC Directives as they apply to built-in equipment. Therefore, this does not guarantee EC Directive compliance in cases where the robot is used independently. Customers who incorporate a MISUMI robot into a system which will be shipped to, or used in, the EU, should therefore verify that the overall system is compliant with EC Directives.

● **Differences between MISUMI single-axis robot (robot and controller) and industrial robot**

MISUMI single-axis robot (robot and controller) is not the industrial robot that is defined in European Standard EN ISO10218-1.
Article 3.10 of this standard defines "industrial robot" as "multipurpose manipulator programmable in three or more axes and MISUMI single-axis robot does not apply to this definition.

■ CE marking

MISUMI robots are components that are incorporated into the customer's system (built-in equipment). We therefore declare regarding EC Directives that MISUMI robots are "Partly completed machinery" and so we do not affix a CE mark to the robots.

■ Applicable EC Directives and their related standards

The following table lists the Directives (and related standards) which apply to the robot's CE Marking compliance.

EC Directive	Related Standards
Machinery Directive 2006/42/EC	EN ISO12100 : Safety of machinery — General principles for design — Risk assessment and risk reduction
EMC Directive 2014/30/EU	EN 55011 : Industrial, scientific and medical equipment — Radio-frequency disturbance characteristics — Limits and methods of measurement EN 61000-6-2 : Electromagnetic compatibility(EMC) — Part6-2: Generic standards — Immunity for industrial environments

■ Cautions regarding the official language of EU countries

For equipment that will be installed in EU countries, the language used for the manuals, warning labels, operation screen characters, and CE declarations is English only.
Warning labels only have pictograms or else include warning messages in English. In the latter case, messages in Japanese or other languages might be added.

2. Safety measures

■ Usage Conditions

The usage conditions which apply to the MISUMI robot series are described below.

- EMC (Electromagnetic Compatibility)

  MISUMI robots are designed for industrial environments. (Applicable standard relating to the EMC Directive: Refer to the EN61000-6-2 Standard, Item 1 "Scope".)
  EMC Directive compliance requires that the customer have the final product (over equipment system) evaluated, with any necessary measures being implemented.

- Explosion-proof

  The robot and driver do not have explosion-proof specifications, and the robot should therefore not be used in environments exposed to flammable gases which could explode or ignite, or to gasoline and solvents, etc.

3. EMC countermeasure example

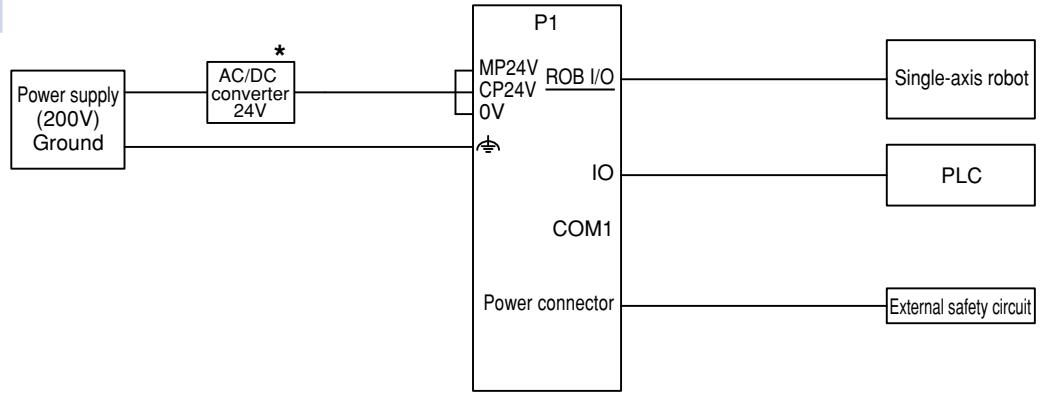
Regarding EMC directives, the customer's final product (entire system) including the MISUMI robot must provide the necessary countermeasures. We at MISUMI determine a model for single units of MISUMI robots (driver, robot, and peripheral device) and verify that it complies with the relevant standards of EMC directives. In order to ensure the customer's final product (entire system) complies with EMC directives, the customer should take appropriate EMC countermeasures. Typical EMC countermeasures for a single unit of MISUMI robot are shown for your reference.

CAUTION

The examples shown here are the countermeasures tested under our installation conditions. When our product is installed in the customer's system, the test results may differ due to the difference in the installation conditions.

● Configuration

EMC countermeasure example



* AC/DC converter JWS100-24: made by TDK Lambda

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Safety cautions

The driver was designed and manufactured with ample consideration given to safety. However, incorrect handling or use may lead to injury, fire, electrical shocks, or other accidents or equipment failures. To prevent possible problems, be sure to observe the following safety cautions at all times.
Also carefully read the safety cautions listed in the robot user's manual and follow all instructions given there.

危険　DANGER　危險　위험

Never enter the robot movement range during operation.
Entering the movement range while the robot is in motion could result in serious accidents or death. A safety enclosure or area sensor with a gate interlock function should be installed to keep all persons safely out of the robot's movement range.

Always turn the main power breaker OFF and establish an "emergency stop" status before performing tasks within the robot's movement range.
Failing to do so could result in serious accidents or death. (See section 7, "Configuring an emergency stop circuit", in Chapter 2.)

The driver and robot were designed as general-purpose industrial equipment, and cannot be used for the following applications.
· In medical equipment systems which are critical to human life.
· In systems which significantly affect society and the general public.
· In environments which are subject to vibration, such as aboard ships and vehicles.

For safety purposes, be sure to install an "emergency stop" circuit.
Use the driver's "emergency stop" input terminal to install a main power shutoff circuit (required).

警告　WARNING　警告　경고

• Installation environment

Use only in environments where the prescribed ambient temperature and humidity are maintained.
Usage in other environments could cause electrical shocks, fires, malfunctions, and product deterioration.

Do not use in environments which are subject to vibration and impact shocks, electromagnetic interference, electrostatic discharges, and radio frequency interference.
Usage in these environments could cause malfunctions and equipment failure.

Do not use in environments which are exposed to water, corrosive gases, metal cutting chips, dust, or direct sunlight.
Usage in these environments could cause malfunctions and equipment failure.

Do not use in flammable or explosive environments.
Usage in these environments could hamper operating tasks, and could possibly cause injuries.

• **Installation environment**

Provide ample space to ensure that tasks (teaching, inspections, etc.) can be performed safely.
Failing to provide adequate space makes tasks difficult to perform, and can cause injuries.

Secure the equipment firmly to a non-flammable vertical wall of metal material.
The driver becomes hot during operation, and must be secured to a metal wall in order to prevent the risk of fires.

Install in a well ventilated site with ample space around the equipment.
Failing to do so could cause malfunctions, equipment failure, and fires.

• **Wiring and connections**

Always shut off the power to the driver before performing wiring work and connecting cables.
Failing to do so could result in electrical shocks and equipment failure.

When connecting cables, use care to avoid subjecting the connectors to impact shocks or excessive loads.
Failing to do so could result in connector pin deformation, and internal PCB damage.

Handle cables with care to avoid damaging them.
Do not attempt to modify the cables, and avoid pulling them or placing heavy objects on them. These actions could damage the cable, possibly resulting in malfunctions and electrical shocks.

Be sure that cable connectors and terminals are fully inserted and securely fastened.
Tighten the fastening screws securely. Failing to do so could cause a poor connection, possibly resulting in malfunctions.

Securely ground the power terminal block's ground terminal.
Failing to do so could result in malfunctions or breakdowns.

• **Operation and handling**

The driver should be operated only by personnel who have received safety and operation training.
Operation by an untrained person is extremely hazardous.

Set the payload, acceleration, and deceleration to appropriate values.
Payload, acceleration, and deceleration settings which differ greatly from the actual values will result in operation time loss, shorten the robot life, and cause vibration. Be sure to set them to appropriate values.

Do not enter the robot's movement range while power is supplied to the driver.
Doing so could result in a serious accident, injury, or death.

Do not touch the driver or robot during operation.
The driver or robot main body becomes hot during operation, and touching them could result in burn injuries.

• **Operation and handling**

Do not remove the driver cover and do not attempt to disassemble or modify the driver.
Doing so could result in fires or equipment failure.

Do not touch or operate the driver with wet hands.
Doing so could result in electrical shocks or equipment failure.

Immediately turn off the power if abnormal odors, sounds, or smoke are noticed during operation.
Failing to do so could result in electrical shocks, fires, or equipment failure. Stop operation immediately, and contact your MISUMI representative.

• **Maintenance and inspection**

Perform maintenance and inspection tasks only when instructions for doing so are provided by MISUMI.
Maintenance and inspection of the driver or robot performed by a person who lacks the proper knowledge or training is extremely hazardous.

Shut off the power to the driver before performing inspections and maintenance tasks.
Shut off the power before beginning the tasks.
Failing to do so could result in electrical shocks or burn injuries.

注意　CAUTION　注意　주의

Use the driver and robot only in the prescribed combinations.
Unsuitable combinations could result in fires and equipment failure.

Save the driver's internal data to an external memory device.
The driver's internal data could be unexpectedly lost, and should therefore be backed up to an external device.

When disposing of this product, it must be handled as industrial waste.
Either dispose of the product in accordance with the local regulations, or engage a commercial disposal service to handle the disposal.

Warranty

The MISUMI robot and/or related product you have purchased are warranted against defects or malfunctions as described below.

Warranty description:

This warranty conforms to the "warranty description" listed at the end of the MISUMI "FA Mechanical Standard Components" catalog.

The following cases are not covered under the warranty:

(1) Products whose serial number or production date (month & year) cannot be verified.

(2) Changes in software or internal data such as programs or points that were created or changed by the customer.

(3) Products whose trouble cannot be reproduced or identified by MISUMI.

(4) Products utilized, for example, in radiological equipment, biological test equipment applications or for other purposes whose warranty repairs are judged as hazardous by MISUMI.

Warranty Period:

The warranty period ends when any of the following applies:

(1) After one year has elapsed from the date of installation

(2) After 2,400 hours of operation

Chapter 1 Overview

Contents

1. Unpacking check

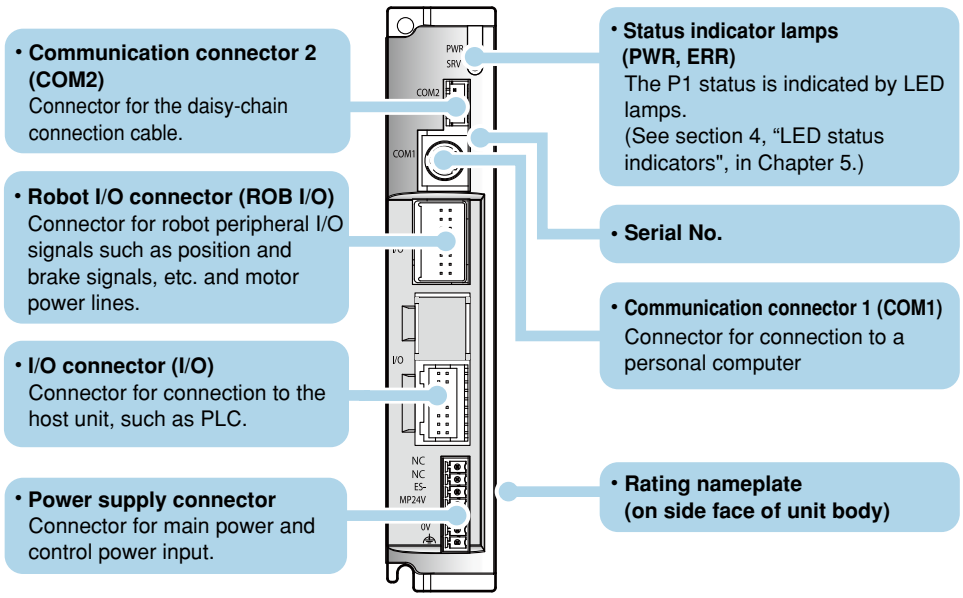
The following accessories are shipped together with this product.

P1	1 unit
Power connector	1 piece

2. Part names and functions

This section explains the part names and functions of the P1.

Part names and functions



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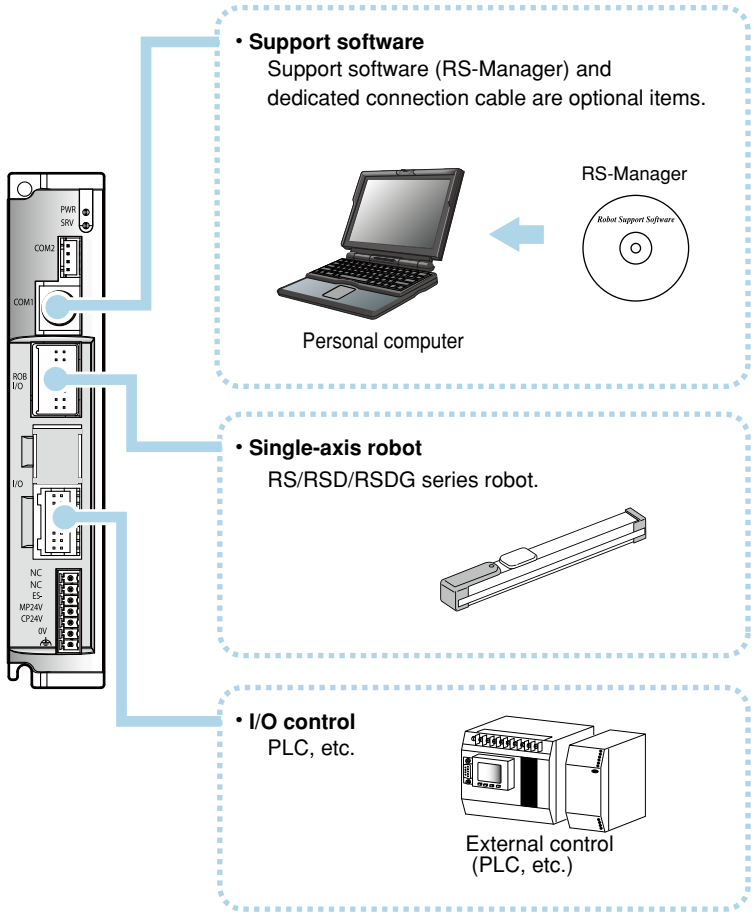
3. System configuration

A robot or PLC is connected to the P1 to configure a desired system.

System configuration diagram



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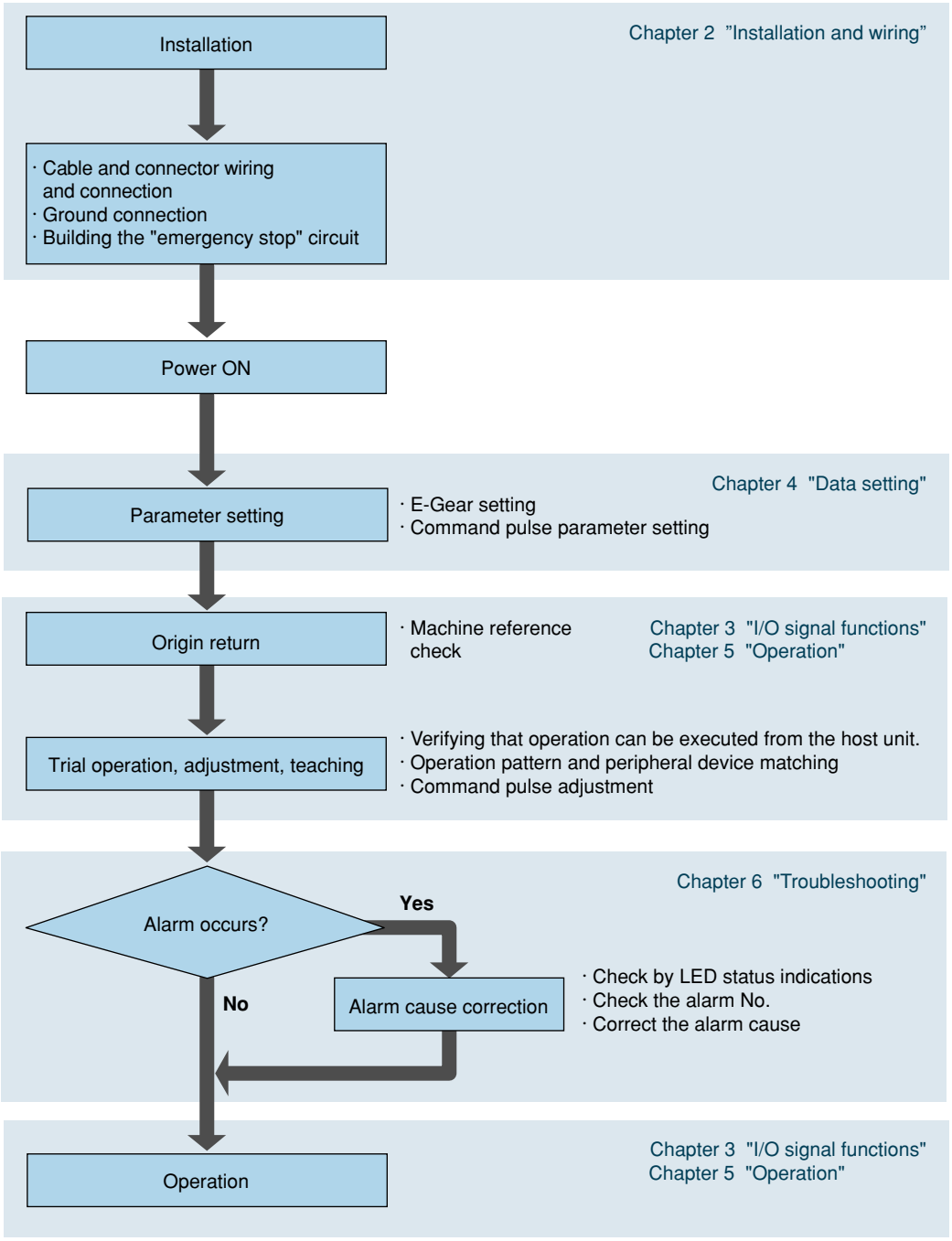
4. Installation and operation sequence

The basic sequence from P1 installation to actual operation is shown below.

Installation and operation sequence



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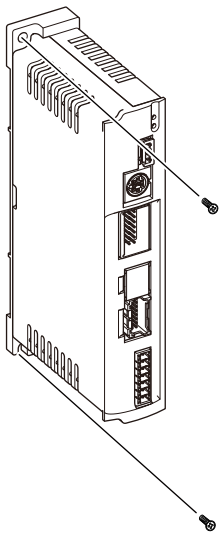
Chapter 2 Installation and wiring

Contents

1. Installation method

Use the mounting screw holes to install the P1 on a vertical wall in the manner shown below.

Installation



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■ Installation screws

Use the following screw type for installation.

Mounting Area Thickness	Hole Dia.	Recommended Screw	Recommended Tightening Torque
5mm	ϕ4.5	M4	0.5 N·m

2. Installation conditions

This section explains the installation conditions necessary to operate the P1 in safe and correct manner.

Installation location

Install the P1 inside the control panel.

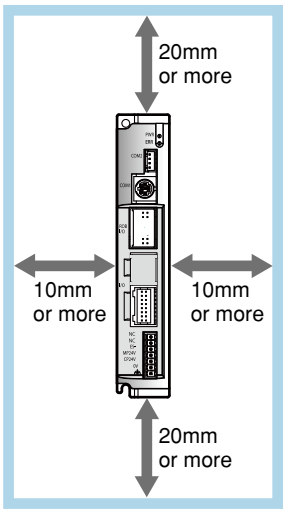
Installation direction

Install the P1 on a vertical wall.

Surrounding space

Install the P1 in a well ventilated location, with space on all sides of the P1. (See the figure below.)

Surrounding space



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Ambient operating temperature and humidity

The P1's ambient operating temperature and humidity must be maintained within the following ranges.

- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)

Environments to be avoided

To ensure safe and correct P1 operation, avoid using the driver in the following environments.

- Environments which contain corrosive gases such as sulfuric acid or hydrochloric acid, or where flammable gases and liquids are present in the atmosphere.
- Environments with excessive dust.
- Environments which contain metal cutting chips, oil, and water, etc., from other machinery.
- Environments subject to excessive vibration.
- Environments where electromagnetic noise or electrostatic noise is generated.
- Environments exposed to direct sunlight.

CAUTION

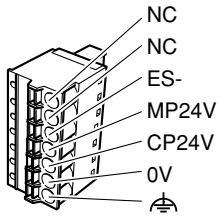
- **Do not install the P1 upside down or at an angle. Doing so could reduce the cooling capacity and cause performance deterioration or malfunctions.**
- **Provide the prescribed spacing between the P1 and the inner face of the control panel, and between the P1 and other device. Otherwise, malfunctions may result.**
- **Avoid using the driver in environments other than those specified. Usage in inappropriate environments could cause product deterioration and malfunctions.**

3. Power supply connection

Use the power connector supplied with the P1 to connect the power supply.

■ Power supply connector terminal names and functions

Power supply connector



Signal name	Description
NC	No connection terminal
ES-	Emergency stop ready signal (open: emergency stop)
MP24V	Main power supply 24V
CP24V	Control power supply 24V
0V	Power supply 0V
⏚	Ground terminal

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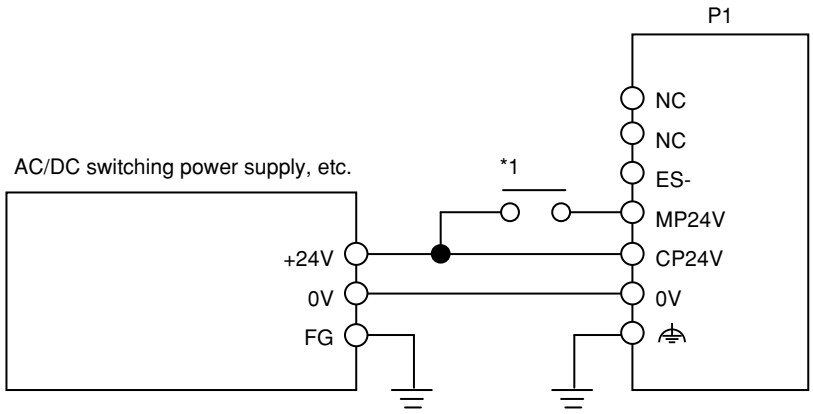
CAUTION

- **Always ground the ground terminal to prevent equipment malfunctions which may be caused by noise.**
- **Do not connect any signal to the NC terminal. Doing so may cause the driver to break.**
- **Use as short a cable as possible to ground the ground terminal.**

■ Power supply connection examples

Power supply connection examples



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*1 : Main power shutoff contact. For details, see section 7, "Configuring an emergency stop circuit".

CAUTION

Be sure that the power supply voltage and the terminal connections are correct. Incorrect voltage and connections could cause an equipment failure.

■ Power requirements

Voltage	24VDC ± 10%
Current	Control power supply: 0.5A per unit Main power supply : 2.5 to 4.0A per unit
Recommended wire size	0.5 to 0.75 sq (AWG 20 to 18)

CAUTION

- **If the current supplied to the P1 is too low, alarm stop or abnormal operation may occur. Carefully select a 24V power supply that provides an adequate current capacity.**
- **Since the P1 uses a capacitor input type power supply circuit, a large inrush current flows when the power is turned on. Do not use fast-blow circuit breakers and fuses.**
  For the same reason, avoid turning the power off and on again repeatedly in intervals of less than 10 seconds. This could harm the main circuit elements in the P1.

Signal Details

- Emergency stop READY signal (ES-)

  This signal is used by the external safety circuit (e.g., safety enclosure, manual switch, etc.) in order to perform robot emergency stops.

Signal Name	Description	Type
ES-	Emergency stop input (emergency stop READY signal)	Input

Explanation

An emergency stop status is established when this signal input is switched OFF, and a "servo OFF" status also occurs at that time.

DANGER

WHEN THE POWER SUPPLY (+24V) IS DIRECTLY CONNECTED TO THE SIGNAL "ES-", THE EXTERNAL EMERGENCY STOP CANNOT BE USED AND THIS IS VERY DANGEROUS. BE SURE TO CONFIGURE AN APPROPRIATE EMERGENCY STOP CIRCUIT.

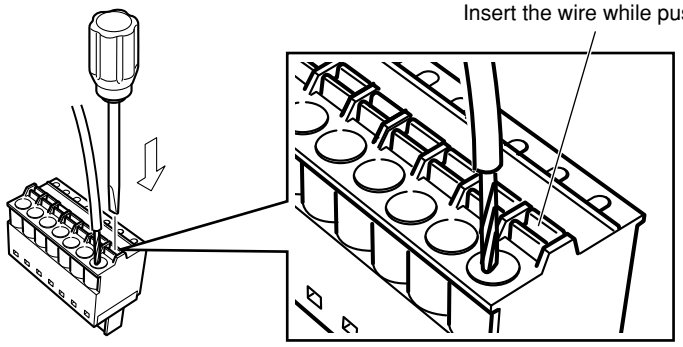
Power supply connector wiring procedure

CAUTION

- **Unplug the power connector from the P1 before wiring.**
- **Only one wire can be inserted into one wire hole of the power connector.**
- **When inserting the wire into the terminal, use care to prevent the core wire from making contact with other conductive parts.**
- **If the inserted portion of the wire is frayed, etc., cut off that portion and restrip the wire, then connect the wire securely.**

The usable wire size is 0.5 to 0.75sq (AWG20 to 18). Strip the sheath from the wire and insert it as shown below. Insert the core wire into the power supply connector's hole as shown below, then verify that the wire is locked (cannot be pulled out).

Wiring method



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4. Connecting the robot

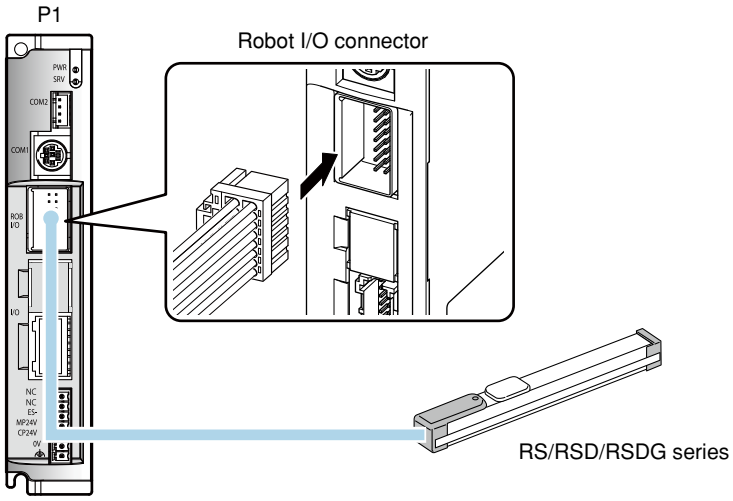
Connect the robot cables to the robot I/O connector on the front panel of the P1.

CAUTION

- **Be sure to use the dedicated cable when connecting the robot.**
- **Shut the power off before connecting the cables.**
- **Insert the cable plug into the connector until a clicking sound is heard (fully inserted).**
- **Connect only the robot which is to be used.**
- **Always grasp the connector body when plugging in and unplugging the cables.**

Connection method

Connecting the robot



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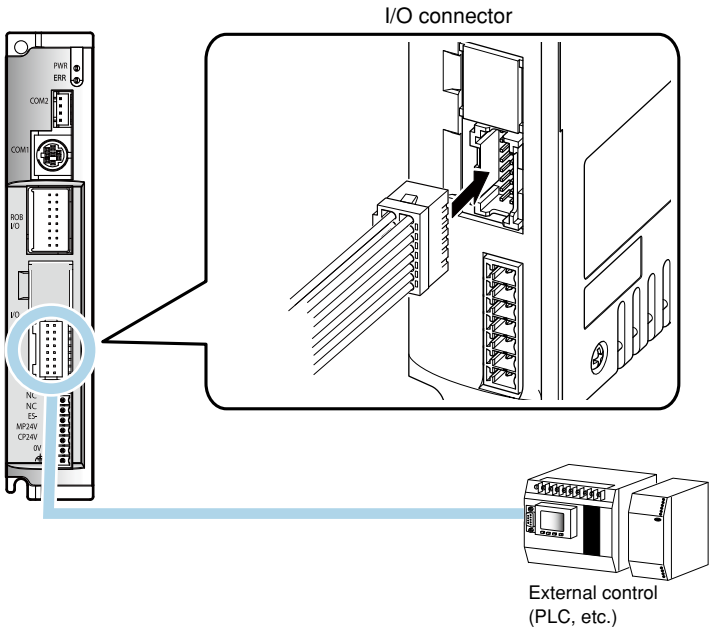
Robot I/O connector signal table

Pin No.	Signal Name	Description
1A	PS+	Resolver SIN input (+)
1B	PS-	Resolver SIN input (-)
2A	PC+	Resolver COS input (+)
2B	PC-	Resolver COS input (-)
3A	R+	Resolver excitation output (+)
3B	R-	Resolver excitation output (-)
4A	FG	Frame ground
4B	FG	
5A	BK+	Brake signal (+)
5B	BK-	Brake signal (-)
6A	A+	Motor "phase A" output (+)
6B	A-	Motor "phase A" output (-)
7A	ACOM	Motor "phase A" common
7B	BCOM	Motor "phase B" common
8A	B+	Motor "phase B" output (+)
8B	B-	Motor "phase B" output (-)

5. Connecting the I/O connector

This I/O connector is intended to connect the host unit, such as PLC.
The return-to-origin or pulse train command operation can be performed from the host unit through the I/O interface.
There are two kinds of pulse train command input methods available, open collector method and line driver method. The P1 can be made applicable to either the open collector method or line driver method by changing the signal wiring connections and parameter settings. So, make appropriate connections and parameter settings suitable for the specifications of the host unit.
For details about input and output signals, see Chapter 3, I/O signal functions.

I/O connector connection



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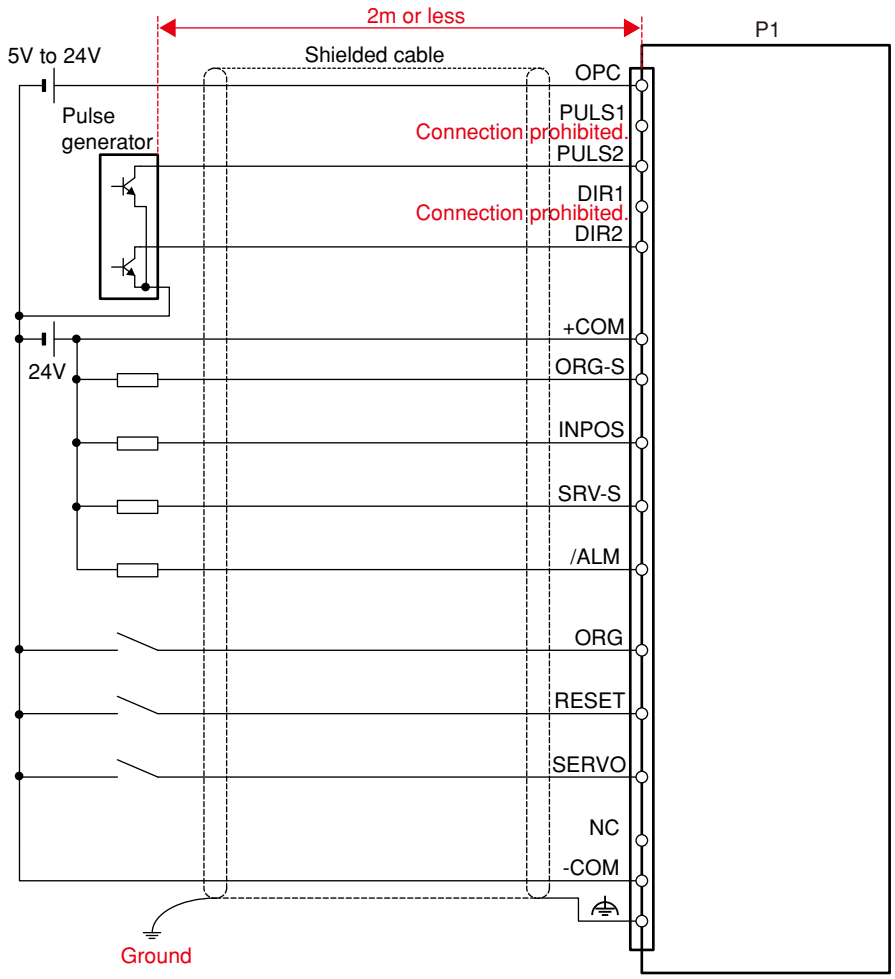
CAUTION

Be sure to perform the wiring with great care so that incorrect terminal numbers are not connected or any line between the terminals is not short-circuited. Incorrect wiring may cause the driver to break.
Before starting the wiring work, carefully check the terminal assignments and connect the I/O connector so that any line between the terminals is not short-circuited.

5.1 Connecting the I/O cable (open collector specifications)

The following shows an example of I/O signal connections to the host unit when the pulse train command input method is the open collector method.

Connection example



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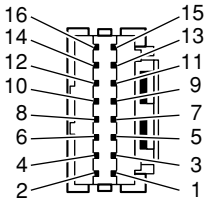
WARNING

- BE SURE TO GROUND THE SHIELD OF THE I/O CABLE. FAILURE TO DO SO MAY CAUSE A MALFUNCTION BY NOISE.
- BE SURE TO USE AN APPROPRIATE SHIELDED CABLE WITH A LENGTH OF 2M OR LESS FOR THE I/O CABLE.
- DO NOT CONNECT ANY RESISTOR TO THE PULSE TRAIN COMMAND INPUT INTERFACE. THE PULSE TRAIN COMMAND INPUT INTERFACE USES A PHOTO-COUPLER. SO, IF ANY RESISTOR IS CONNECTED TO THE SIGNAL LINE, THE CURRENT DECREASES, CAUSING A MALFUNCTION.
- A PULL-UP RESISTOR MAY BE INCORPORATED INTO THE OPEN COLLECTOR OUTPUT OF THE PULSE GENERATOR. IN THIS CASE, REMOVE THE PULL-UP RESISTOR OR USE A PORT WITHOUT PULL-UP RESISTOR. IF THE PULL-UP RESISTOR IS USED, THE CURRENT DECREASES, CAUSING A MALFUNCTION.
- WHEN USING THE OPEN COLLECTOR METHOD, DO NOT CONNECT ANY SIGNAL TO THE PULS1 AND DIR1 TERMINALS. DOING SO MAY CAUSE THE DRIVER TO MALFUNCTION OR BREAK.
- BE SURE TO CONNECT ONE P1 TO ONE PULSE GENERATOR.
  IF MULTIPLE DRIVERS ARE CONNECTED IN PARALLEL, THIS MAY CAUSE A MALFUNCTION.
- BE SURE TO PERFORM THE WIRING WITH GREAT CARE SO THAT INCORRECT TERMINAL NUMBERS ARE NOT CONNECTED OR THE LINE BETWEEN THE TERMINALS IS NOT SHORT-CIRCUITED. INCORRECT WIRING MAY CAUSE THE DRIVER TO BREAK OR MALFUNCTION.

Description	Color	Signal Name	Terminal No.
Ground	Drain line	FG	16
Servo status	Green (white dot)	SRV-S	14
Positioning completion	Blue (red dot)	IN-POS	12
Servo ON	Purple	SERVO	10
Prohibited to use this signal.	Yellow	NC	8
Command direction input	Red	DIR2	6
Command pulse input	Brown	PULS2	4
Open collector power supply input	Orange	OPC	2



Terminal No.	Signal Name	Color	Description
15	-COM	Brown (white dot)	0V
13	/ALM	Orange (white dot)	Alarm
11	ORG-S	White	Return-to-origin end status
9	RESET	Pink	Reset
7	ORG	Black	Return-to-origin
5	DIR1	Gray	Not used (Connection prohibited.)
3	PULS1	Green	Not used (Connection prohibited.)
1	+COM	Blue	I/O power supply input (DC 24V ± 10%)

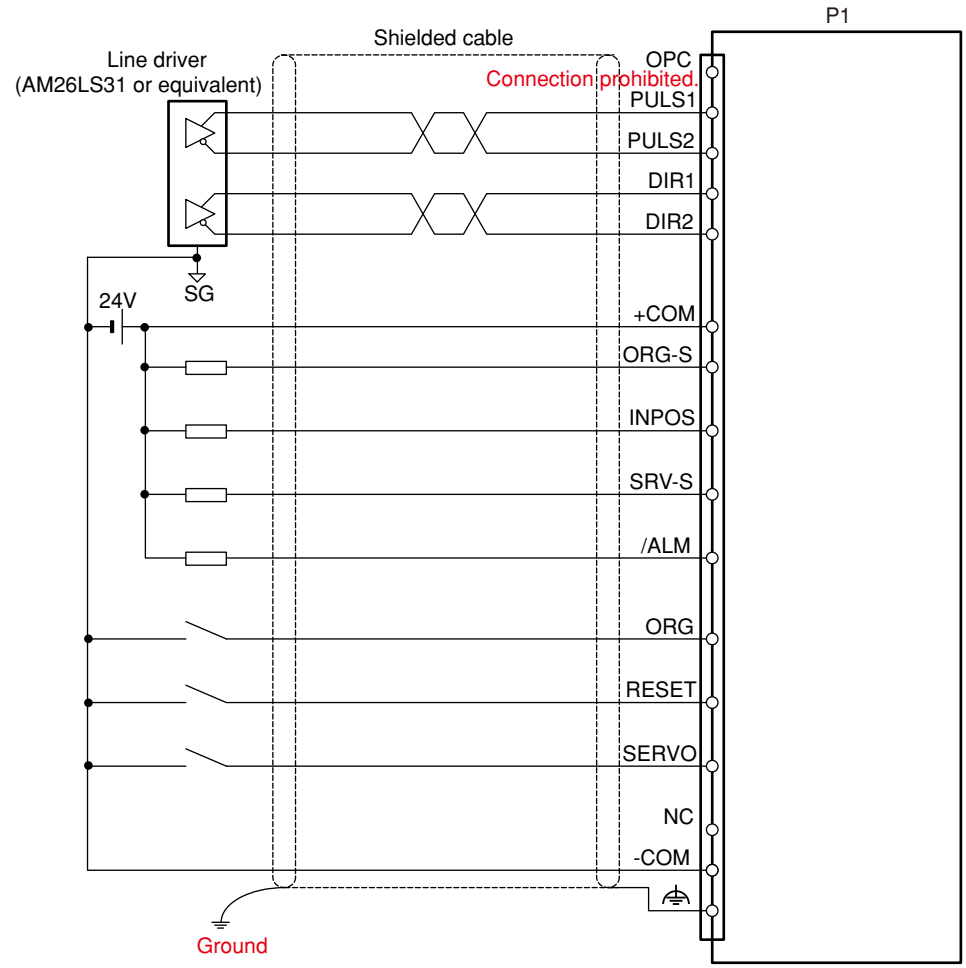
* It is prohibited to connect terminal Nos. 3 (PULS1) and 5 (DIR1).

23212-M4-00

5.2 Connecting the I/O cable (line driver specifications)

The following shows an example of I/O signal connections to the host unit when the pulse train command input method is the line driver method.

Connection example



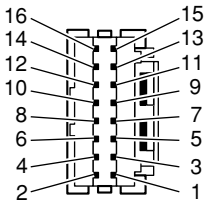
63208-MC-00

WARNING

- BE SURE TO GROUND THE SHIELD OF THE I/O CABLE. FAILURE TO DO SO MAY CAUSE A MALFUNCTION BY NOISE.
- BE SURE TO USE AN APPROPRIATE TWISTED PAIR SHIELDED CABLE FOR THE I/O CABLE.
- DO NOT CONNECT ANY RESISTOR TO THE PULSE TRAIN COMMAND INPUT INTERFACE. THE PULSE TRAIN COMMAND INPUT INTERFACE USES A PHOTO-COUPLER. SO, IF ANY RESISTOR IS CONNECTED TO THE SIGNAL LINE, THE CURRENT DECREASES, CAUSING A MALFUNCTION.
- WHEN USING THE LINE DRIVER METHOD, DO NOT CONNECT ANY SIGNAL TO THE OPC TERMINAL. DOING SO MAY CAUSE THE DRIVER TO MALFUNCTION OR BREAK.
- BE SURE TO PERFORM THE WIRING WITH GREAT CARE SO THAT INCORRECT TERMINAL NUMBERS ARE NOT CONNECTED OR THE LINE BETWEEN THE TERMINALS IS NOT SHORT-CIRCUITED. INCORRECT WIRING MAY CAUSE THE DRIVER TO BREAK OR MALFUNCTION.

Description	Color	Signal Name	Terminal No.
Ground	Drain line	FG	16
Servo status	Green (white dot)	SRV-S	14
Positioning completion	Blue (red dot)	IN-POS	12
Servo ON	Purple	SERVO	10
Prohibited to use this signal.	Yellow	NC	8
Command direction input (-)	Red	DIR2	6
Command pulse input (-)	Brown	PULS2	4
Not used (Connection prohibited.)	Orange	OPC	2

* It is prohibited to connect terminal No. 2 (OPC).



Terminal No.	Signal Name	Color	Description
15	-COM	Brown (white dot)	0V
13	/ALM	Orange (white dot)	Alarm
11	ORG-S	White	Return-to-origin end status
9	RESET	Pink	Reset
7	ORG	Black	Return-to-origin
5	DIR1	Gray	Command direction input (+)
3	PULS1	Green	Command pulse input (+)
1	+COM	Blue	I/O power supply input (DC 24V ± 10%)

23212-M4-00

6. Connecting the communication unit

The P1 can be set up or operated from a personal computer (support software RS-Manager).

- Support software RS-Manager Ver. 1.3.0 or higher is required to operate the P1.
- An optional communication connection cable is required to connect the P1 to the personal computer.

Connecting to the personal computer

Use the dedicated communication connection cable that is available as an optional item.

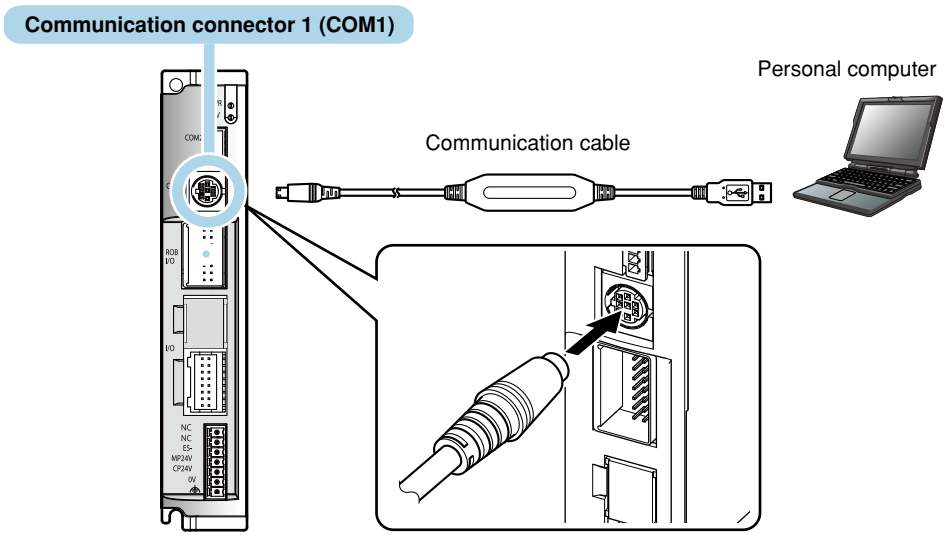
WARNING

DO NOT OPERATE THE ROBOT USING THE RS-MANAGER WITHIN THE ROBOT MOVABLE AREA.

CAUTION

- **Be sure to turn off the controller power when connecting or disconnecting the communication connector (COM1). When connecting or disconnecting the communication connector (COM1) with the power turned on, this may cause the internal circuit to break.**
- **Select either the USB or D-Sub connection cable for the communication cable. When performing the communication through the USB port of the personal computer, use an appropriate USB connection communication cable. If the D-Sub communication cable is connected to the USB port through a commercially available USB conversion cable, the operation cannot be guaranteed.**
- **Do not modify the communication cable. This can cause communication errors and equipment failure.**
- **Always grasp the connector body when connecting/disconnecting the communication cable to/from the driver. Pulling on the cable can cause equipment failure or breaking of wire.**
- **An incorrectly inserted connector or poor contact condition can cause malfunctions or equipment failure. Be sure that the connector is correctly and securely connected.**
- **When disconnecting the connector from the driver, pull the connector straight out to avoid bending the connector pins.**

Communication device connection

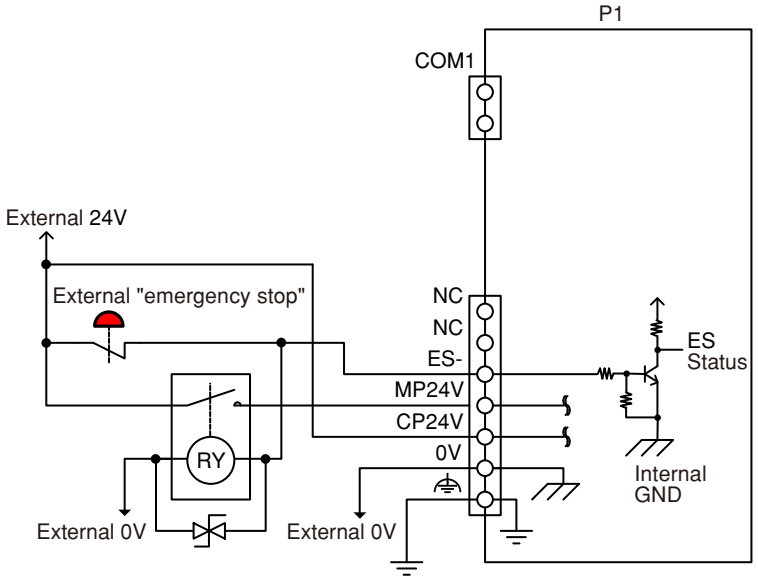


23210-M4-00

7. Configuring an emergency stop circuit

The power supply connector provides functions for configuring safety circuits, including the robot. The following shows a power connector and host unit connection example.

Emergency stop circuit example



63206-MC-00

DANGER

IN ORDER TO FLEXIBLY ACCOMMODATE THE VARIOUS SAFETY CATEGORIES REQUIRED BY CUSTOMERS, THE P1 IS NOT EQUIPPED WITH AN INTERNAL MAIN POWER SHUTOFF CIRCUIT.
THEREFORE, BE SURE TO INSTALL AN EXTERNAL MAIN POWER SHUTOFF CIRCUIT AND AN "EMERGENCY STOP" CIRCUIT.

DANGER

WHEN THE POWER SUPPLY (+24V) IS DIRECTLY CONNECTED TO THE SIGNAL "ES-", THE EXTERNAL EMERGENCY STOP CANNOT BE USED AND THIS IS VERY DANGEROUS. BE SURE TO CONFIGURE AN APPROPRIATE EMERGENCY STOP CIRCUIT.

Chapter 3 I/O signal functions

Contents

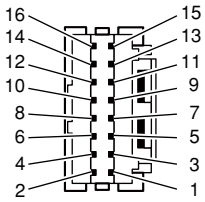
1. I/O specifications

The return-to-origin or pulse train command operation can be performed from the host unit through the I/O interface. There are two kinds of pulse train command input methods available, open collector method and line driver method. The P1 can be made applicable to either the open collector method or line driver method by changing the signal wiring connections and parameter settings. So, make appropriate connections and parameter settings suitable for the specifications of the host unit.

2. Open collector specifications

2.1 I/O signal table

I/O connector



Terminal No.	Signal Name	Description	Terminal No.	Signal Name	Description
1	+COM	I/O power supply input (DC 24V ± 10%)	2	OPC	Open collector power supply input
3	PULS1	Not used (Connection prohibited.)	4	PULS2	Command pulse input
5	DIR1	Not used (Connection prohibited.)	6	DIR2	Command direction input
7	ORG	Return-to-origin	8	NC	Prohibited to use this signal.
9	RESET	Reset	10	SERVO	Servo ON
11	ORG-S	Return-to-origin end status	12	IN-POS	Positioning completion
13	/ALM	Alarm	14	SRV-S	Servo status
15	-COM	0V	16	FG	Ground

23311-M4

2.2 I/O signal list

Type	Signal Name	Meaning	Description
Inputs	OPC	Open collector power supply input	Input the power supply for the open collector. DC5 to 24V ± 10%
	PULS2	Command pulse input	Pulse train command input terminals. A desired command form can be selected from three kinds of command forms using the parameter K83 (pulse train input type). • Phase A/Phase B input • Pulse/Sign input • CW/CCW input
	DIR2	Command direction input	
	ORG	Return-to-origin	Starts return-to-origin when ON and stops it when OFF.
	RESET	Reset	Alarm reset
	SERVO	Servo ON	ON: servo on; OFF: servo off.
Outputs	ORG-S	Return-to-origin end status	ON at return-to-origin end.
	IN-POS	Positioning completion	ON when the pulse accumulation in the deviation counter becomes within ± set value of the parameter K3.
	/ALM	Alarm	ON when normal. OFF when alarm occurs.
	SRV-S	Servo status	ON when servo is on.

CAUTION

When using the open collector specifications, do not connect any signal to the PULS1 and DIR1 terminals. Doing so may cause the driver to malfunction or break.

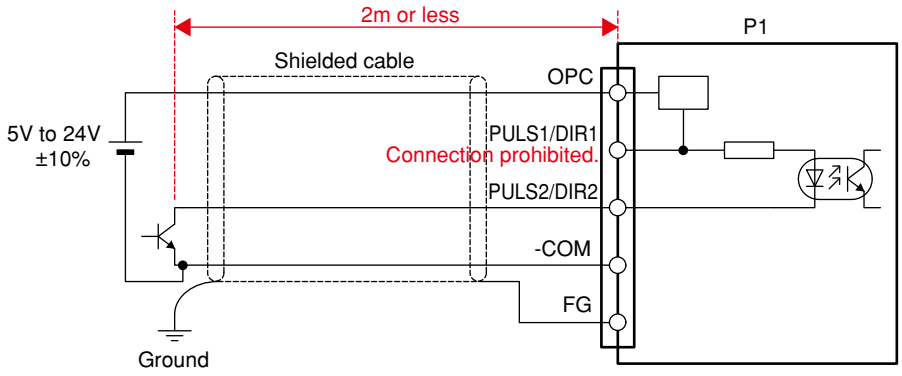
2.3 Input signal details

This section explains the input signals in detail.

2.3.1 Command pulse input and command direction input (OPC, PULS2, DIR2)

Connect the pulse train command inputs as shown in the figure below.

Pulse train command input connection



63301-MC-00

CAUTION

Use the open collector output power supply in a range of DC5 to 24V ± 10%.
It is not necessary to insert any load resistor even when the voltage differs.

WARNING

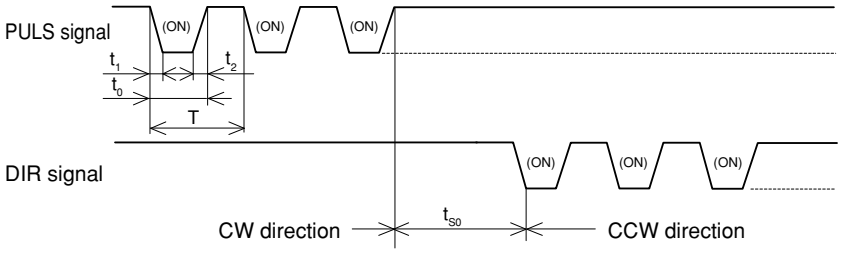
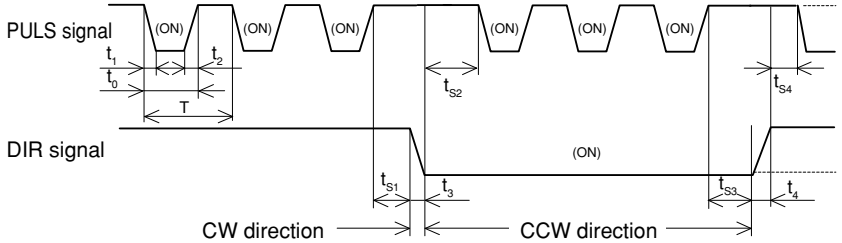
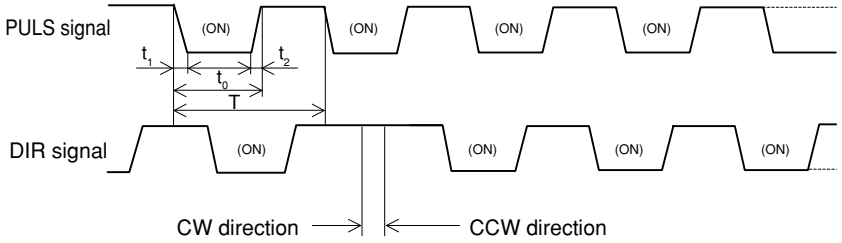
- BE SURE TO GROUND THE SHIELD OF THE I/O CABLE. FAILURE TO DO SO MAY CAUSE A MALFUNCTION BY NOISE.
- BE SURE TO USE AN APPROPRIATE SHIELDED CABLE WITH A LENGTH OF 2M OR LESS FOR THE I/O CABLE.
- DO NOT CONNECT ANY RESISTOR TO THE PULSE TRAIN COMMAND INPUT INTERFACE. THE PULSE TRAIN COMMAND INPUT INTERFACE USES A PHOTO-COUPLER. SO, IF ANY RESISTOR IS CONNECTED TO THE SIGNAL LINE, THE CURRENT DECREASES, CAUSING A MALFUNCTION.
- A PULL-UP RESISTOR MAY BE INCORPORATED INTO THE OPEN COLLECTOR OUTPUT OF THE PULSE GENERATOR. IN THIS CASE, REMOVE THE PULL-UP RESISTOR OR USE A PORT WITHOUT PULL-UP RESISTOR. IF THE PULL-UP RESISTOR IS USED, THE CURRENT DECREASES, CAUSING A MALFUNCTION.
- WHEN USING THE OPEN COLLECTOR METHOD, DO NOT CONNECT ANY SIGNAL TO THE PULS1 AND DIR1 TERMINALS. DOING SO MAY CAUSE THE DRIVER TO MALFUNCTION OR BREAK.
- BE SURE TO CONNECT ONE P1 TO ONE PULSE GENERATOR.
  IF MULTIPLE DRIVERS ARE CONNECTED IN PARALLEL, THIS MAY CAUSE A MALFUNCTION.
- BE SURE TO PERFORM THE WIRING WITH GREAT CARE SO THAT INCORRECT TERMINAL NUMBERS ARE NOT CONNECTED OR THE LINE BETWEEN THE TERMINALS IS NOT SHORT-CIRCUITED. INCORRECT WIRING MAY CAUSE THE DRIVER TO BREAK OR MALFUNCTION.

Kind of pulse train	K83	Input signal	CW direction	CCW direction
CW/CCW	1	PULS2 (Transistor)	(ON) (OFF) (ON) (OFF) (ON) (OFF)	(OFF)
		DIR2 (Transistor)	(OFF)	(ON) (OFF) (ON) (OFF) (ON) (OFF)
Pulse/Sign	2	PULS2 (Transistor)	(ON) (OFF) (ON) (OFF) (ON) (OFF)	(ON) (OFF) (ON) (OFF) (ON) (OFF)
		DIR2 (Transistor)	(ON)	(OFF)
Phase A/Phase B	3	PULS2 (Transistor)	(ON) (OFF) (ON) (OFF) (ON) (OFF)	(ON) (OFF) (ON) (OFF) (ON) (OFF)
		DIR2 (Transistor)	(ON) (OFF) (ON) (OFF) (ON)	(OFF) (ON) (OFF) (ON) (OFF)

* ↑↓ stated in the table above shows the pulse train command fetch timing.

A robot (TRANSERVO series) that can be connected to the P1 moves in the plus-direction (toward the side opposite to the motor) as the motor turns CW and in the minus-direction (toward the motor) as the motor turns CCW.

Pulse train command input timing

Kind of pulse train	Pulse train command input timing
(1)CW/CCW	
(2)Pulse/Sign	
(3)Phase A/Phase B	

* (ON) stated in the timing chart above shows that the transistor of the open collector pulse generator is ON.

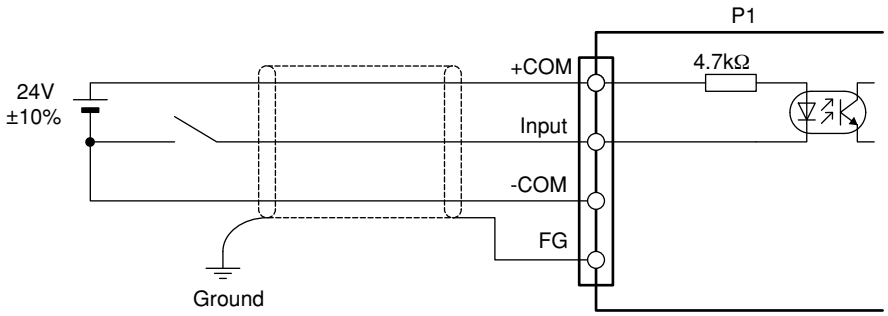
Pulse train command input timing values

Kind of pulse train (See above)		Open collector	
		(1), (2) above	(3) above
Timing values	Rise time : t_2, t_4	0.4µs or less	0.4µs or less
	Fall time : t_1, t_3	0.4µs or less	0.4µs or less
	Switching time : t_{S0}, t_{S1}, t_{S2}, t_{S3}, t_{S4}	15µs or more	–––
	Pulse width : $(t_0/T) \times 100$	50 ± 10%	50 ± 10%
Maximum pulse rate		100kpps or less	25kpps or less

2.3.2 I/O inputs

This section explains the I/O input signals in detail.
Connect the I/O input signals as shown in the figure below.

I/O input signal connection



63304-MC-00

Type	DC input (plus common type) Photo-coupler isolation format
Load	DC24V±10% 4.7mA

■ ORG

This input executes a return-to-origin operation. This establishes the robot coordinates.

WARNING

BEFORE STARTING THE RETURN-TO-ORIGIN OPERATION, MAKE SURE THAT THE ROBOT OPERATION BY THE PULSE TRAIN COMMAND INPUT FROM THE HOST UNIT IS NOT RUNNING. IF THE RETURN-TO-ORIGIN OPERATION IS STARTED WHILE THE ROBOT IS MOVING BY THE PULSE TRAIN COMMAND INPUT, THE RETURN-TO-ORIGIN OPERATION MAY NOT BE COMPLETED CORRECTLY.

CAUTION

- **If this signal is turned OFF during the return-to-origin operation, the return-to-origin operation is cancelled and it is not completed correctly. This signal must be kept turned ON until the return-to-origin is completed successfully. To verify whether or not the return-to-origin has been completed successfully, check the return-to-origin end status output (ORG-S).**
- **Even when this signal is turned ON during the JOG operation or inching operation controlled from the RS-Manager, the return-to-origin operation does not start. Additionally, the JOG operation or inching operation cannot be started from the RS-Manager while this signal is ON.**
- **The robot can be operated without use of this function, but the P1 cannot recognize the absolute position of the robot. If this function is not used, an external sensor must be installed or other similar measures must be taken so that the host unit monitors the robot position.**

■ RESET

If an alarm resulting from the internal cause occurs, remove the cause of the alarm and turn ON this signal to reset the alarm. As the alarm is reset, the alarm output (/ALM) becomes ON.
Note that there are some alarms that cannot be reset.
If an alarm resulting from the external cause occurs, removing the cause of the alarm will turn ON the alarm output (/ALM). In this case, it is not necessary to turn ON the RESET signal.

■ SERVO

A servo ON status is established while this signal is ON.
The servo ON status affects the servo status output (SRV-S).
* A servo ON is not possible while an alarm is active.

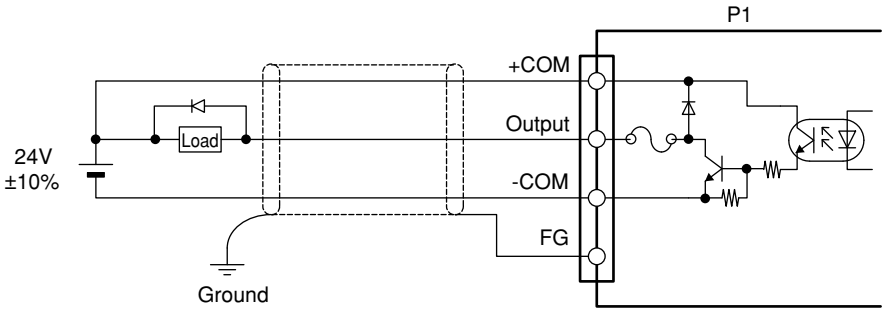
CAUTION

A "servo OFF" should be performed only when operation is stopped. Do not use "servo OFF" to perform emergency stops.

2.4 Output signal details

This section explains the output signals in detail.
Connect the output signals as shown in the figure below.

Output signal connection



63305-MC-00

Type	NPN open collector output (Minus common type) Photo-coupler isolation format
Load	24VDC, 50mA per point

■ ORG-S

This signal output is ON when return-to-origin is complete, and is OFF when incomplete.
When the servo turns OFF after this signal has been output, this signal also becomes OFF.

■ IN-POS

When the pulse accumulation in the deviation counter becomes within ± set value of the parameter K3 (positioning completion width), this signal becomes ON (except for return-to-origin in progress). This signal is always ON while the servo is OFF.

CAUTION

If the command speed is low or if the set value of the parameter K3 is large, this signal may always become ON.

■ /ALM

This signal is ON during a normal status, and switches OFF when an alarm occurs.

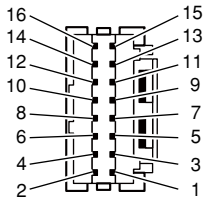
■ SRV-S

This signal is ON while a "servo ON" status exists, and switches OFF when a "servo OFF" status occurs.

3. Line driver specifications

3.1 I/O signal table

I/O connector



Terminal No.	Signal Name	Description	Terminal No.	Signal Name	Description
1	+COM	I/O power supply input (DC 24V ± 10%)	2	OPC	Not used (Connection prohibited.)
3	PULS1	Command pulse input (+)	4	PULS2	Command pulse input (-)
5	DIR1	Command direction input (+)	6	DIR2	Command direction input (-)
7	ORG	Return-to-origin	8	NC	Prohibited to use this signal.
9	RESET	Reset	10	SERVO	Servo ON
11	ORG-S	Return-to-origin end status	12	IN-POS	Positioning completion
13	/ALM	Alarm	14	SRV-S	Servo status
15	-COM	0V	16	FG	Ground

23311-M4

3.2 I/O signal list

Type	Signal Name	Meaning	Description
Inputs	PULS1	Command pulse input (+)	Pulse train command input terminals. A desired command form can be selected from three kinds of command forms using the parameter K83 (pulse train input type). • Phase A/Phase B input • Pulse/Sign input • CW/CCW input
	PULS2	Command pulse input (-)	
	DIR1	Command direction input (+)	
	DIR2	Command direction input (-)	
	ORG	Return-to-origin	Starts return-to-origin when ON and stops it when OFF.
	RESET	Reset	Alarm reset
	SERVO	Servo ON	ON: servo on; OFF: servo off.
Outputs	ORG-S	Return-to-origin end status	ON at return-to-origin end.
	IN-POS	Positioning completion	ON when the pulse accumulation in the deviation counter becomes within ± set value of the parameter K3.
	/ALM	Alarm	ON when normal. OFF when alarm occurs.
	SRV-S	Servo status	ON when servo is on.

CAUTION

When using the line driver specifications, do not connect any signal to the OPC terminal. Doing so may cause the driver to malfunction or break.

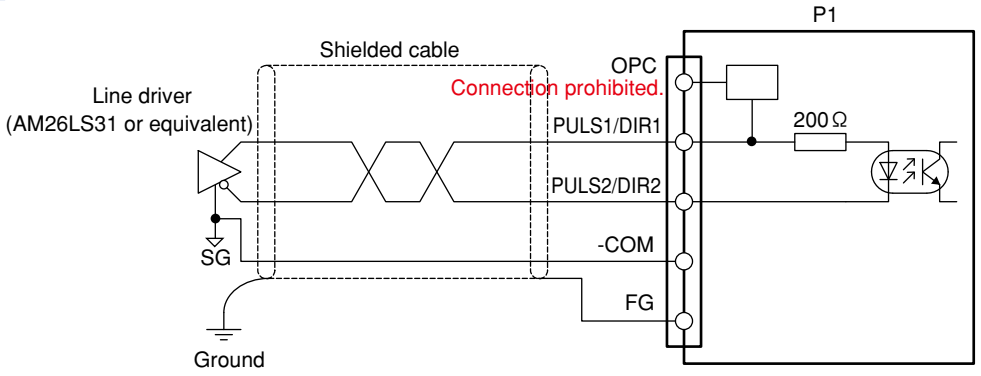
3.3 Input signal details

This section explains the input signals in detail.

3.3.1 Command pulse input and command direction input (PULS1, PULS2, DIR1, DIR2)

Connect the pulse train command inputs as shown in the figure below.

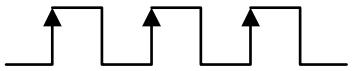
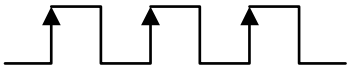
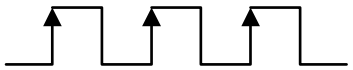
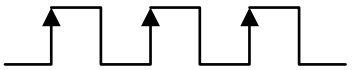
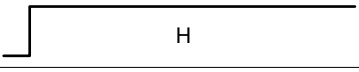
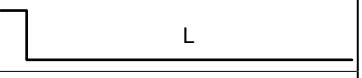
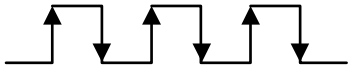
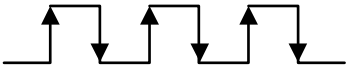
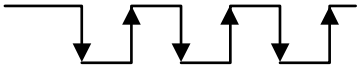
Pulse train command input connection



63306-MC-00

WARNING

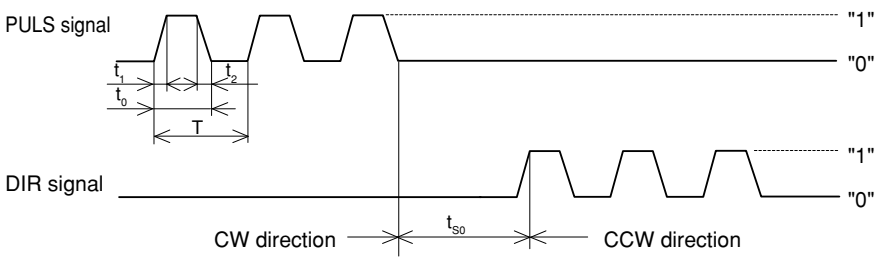
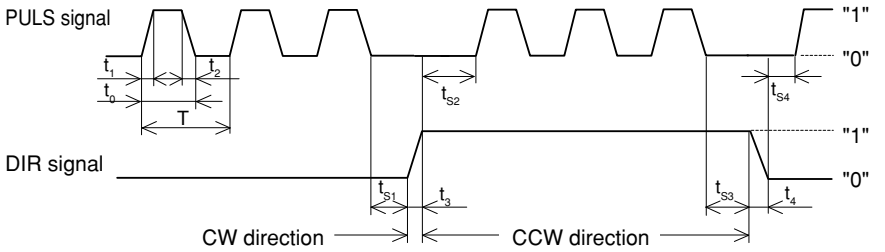
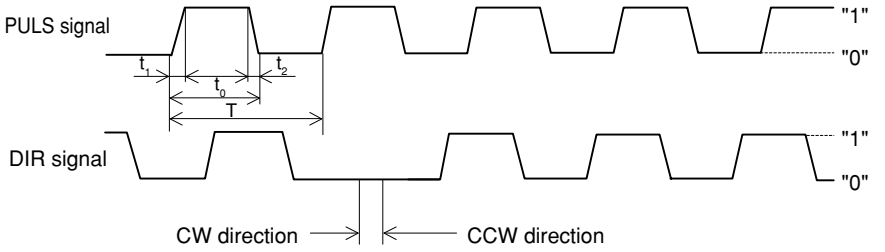
- BE SURE TO GROUND THE SHIELD OF THE I/O CABLE. FAILURE TO DO SO MAY CAUSE A MALFUNCTION BY NOISE.
- BE SURE TO USE AN APPROPRIATE TWIST-PAIR SHIELDED CABLE FOR THE I/O CABLE.
- DO NOT CONNECT ANY RESISTOR TO THE PULSE TRAIN COMMAND INPUT INTERFACE. THE PULSE TRAIN COMMAND INPUT INTERFACE USES A PHOTO-COUPLER. SO, IF ANY RESISTOR IS CONNECTED TO THE SIGNAL LINE, THE CURRENT DECREASES, CAUSING A MALFUNCTION.
- WHEN USING THE LINE DRIVER METHOD, DO NOT CONNECT ANY SIGNAL TO THE OPC TERMINAL. DOING SO MAY CAUSE THE DRIVER TO MALFUNCTION OR BREAK.
- BE SURE TO PERFORM THE WIRING WITH GREAT CARE SO THAT INCORRECT TERMINAL NUMBERS ARE NOT CONNECTED OR THE LINE BETWEEN THE TERMINALS IS NOT SHORT-CIRCUITED. INCORRECT WIRING MAY CAUSE THE DRIVER TO BREAK.

Kind of pulse train	K83	Input signal	CW direction	CCW direction
CW/CCW	5	PULS1 PULS2		
		DIR1 DIR2		
Pulse/Sign	6	PULS1 PULS2		
		DIR1 DIR2	 H	 L
Phase A/Phase B	7	PULS1 PULS2		
		DIR1 DIR2		

* ↑↓ stated in the table above shows the pulse train command fetch timing.

A robot (TRANSERVO series) that can be connected to the P1 moves in the plus-direction (toward the side opposite to the motor) as the motor turns CW and in the minus-direction (toward the motor) as the motor turns CCW.

Pulse train command input timing

Kind of pulse train	Pulse train command input timing
(1)CW/CCW	
(2)Pulse/Sign	
(3)Phase A/Phase B	

* When at logic "1", the current direction of the pulse train command input is PULS1 → PULS2, DIR1 → DIR2.

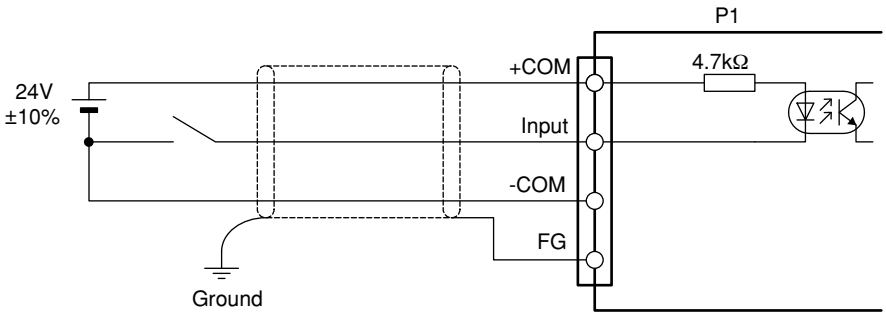
Pulse train command input timing values

Kind of pulse train (See above)		Line driver	
		(1), (2) above	(3) above
Timing values	Rise time : t_1, t_3	0.4µs or less	0.4µs or less
	Fall time : t_2, t_4	0.4µs or less	0.4µs or less
	Switching time : t_{S0}, t_{S1}, t_{S2}, t_{S3}, t_{S4}	4µs or more	–––
	Pulse width : $(t_0/T) \times 100$	50 ± 10%	50 ± 10%
Maximum pulse rate		500kpps or less	125kpps or less

3.3.2 I/O inputs

This section explains the I/O input signals in detail.
Connect the I/O input signals as shown in the figure below.

I/O input signal connection



63309-MC-00

Type	DC input (plus common type) Photo-coupler isolation format
Load	DC24V±10% 4.7mA

■ ORG

This input executes a return-to-origin operation. This establishes the robot coordinates.

WARNING

BEFORE STARTING THE RETURN-TO-ORIGIN OPERATION, MAKE SURE THAT THE ROBOT OPERATION BY THE PULSE TRAIN COMMAND INPUT FROM THE HOST UNIT IS NOT RUNNING. IF THE RETURN-TO-ORIGIN OPERATION IS STARTED WHILE THE ROBOT IS MOVING BY THE PULSE TRAIN COMMAND INPUT, THE RETURN-TO-ORIGIN OPERATION MAY NOT BE COMPLETED CORRECTLY.

CAUTION

- **If this signal is turned OFF during the return-to-origin operation, the return-to-origin operation is cancelled and it is not completed correctly. This signal must be kept turned ON until the return-to-origin is completed successfully. To verify whether or not the return-to-origin has been completed successfully, check the return-to-origin end status output (ORG-S).**
- **Even when this signal is turned ON during the JOG operation or inching operation controlled from the RS-Manager, the return-to-origin operation does not start. Additionally, the JOG operation or inching operation cannot be started from the RS-Manager while this signal is ON.**
- **The robot can be operated without use of this function, but the P1 cannot recognize the absolute position of the robot. If this function is not used, an external sensor must be installed or other similar measures must be taken so that the host unit monitors the robot position.**

■ RESET

If an alarm resulting from the internal cause occurs, remove the cause of the alarm and turn ON this signal to reset the alarm. As the alarm is reset, the alarm output (/ALM) becomes ON.
Note that there are some alarms that cannot be reset.
If an alarm resulting from the external cause occurs, removing the cause of the alarm will turn ON the alarm output (/ALM). In this case, it is not necessary to turn ON the RESET signal.

■ SERVO

A servo ON status is established while this signal is ON.
The servo ON status affects the servo status output (SRV-S).
* A servo ON is not possible while an alarm is active.

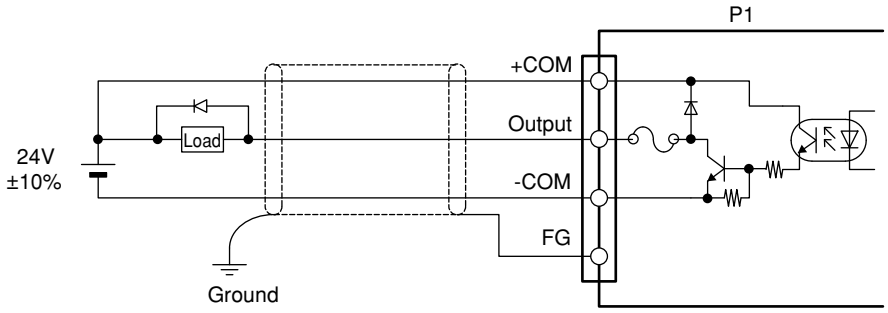
CAUTION

A "servo OFF" should be performed only when operation is stopped. Do not use "servo OFF" to perform emergency stops.

3.4 Output signal details

This section explains the output signals in detail.
Connect the output signals as shown in the figure below.

Output signal connection



63310-MC-00

Type	NPN open collector output (Minus common type) Photo-coupler isolation format
Load	24VDC, 50mA per point

■ ORG-S

This signal output is ON when return-to-origin is complete, and is OFF when incomplete.
When the servo turns OFF after this signal has been output, this signal also becomes OFF.

■ IN-POS

When the pulse accumulation in the deviation counter becomes within ± set value of the parameter K3 (positioning completion width), this signal becomes ON (except for return-to-origin in progress). This signal is always ON while the servo is OFF.

CAUTION

If the command speed is low or if the set value of the parameter K3 is large, this signal may always become ON.

■ /ALM

This signal is ON during a normal status, and switches OFF when an alarm occurs.

■ SRV-S

This signal is ON while a "servo ON" status exists, and switches OFF when a "servo OFF" status occurs.

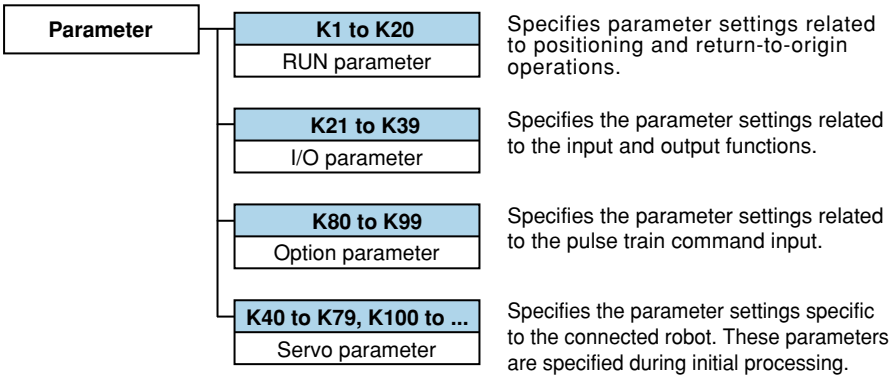
Chapter 4 Data setting

Contents

1. Data overview

It is necessary to specify the parameter data settings in order to operate a robot from the P1.
The parameter data can be set using the RS-Manager (version 1.3.0 or higher).
The parameter data is classified into the following categories: "RUN parameters", "I/O parameters", "Option parameters", and "Servo parameters".

Data configuration



23401-M4-00

2. Parameter data

The 4 types of parameter data are shown below.

Type	Description
RUN parameter	These parameters are required for robot operation. They include the "positioning" and "return-to-origin" settings.
I/O parameter	These parameters are intended for the I/O functions.
Option parameter	These parameters are related to the pulse train settings. They include the "pulse train input type" and "E-Gear" settings.
Servo parameter	These parameters are robot-specific parameters. They include the "gain", "rating", and "max. current" settings.

2.1 Parameter list

When new data is created or transmitted, all parameters are set to their standard values (default values) in accordance with the specifications of the selected robot and the payload. The following list shows the parameter setting ranges and default settings.

NOTE

For details regarding parameters see section 2.2, "Parameter details".

2.1.1 RUN parameters

- **Positioning**

No.	Name	Setting / Setting Range	Units	Default	Restart
1	(-) soft limit (JOG operation only)	-9999.99 to 9999.99	mm	0.00	-
2	(+) soft limit (JOG operation only)	-9999.99 to 9999.99	mm	Depends on robot type	-
3	In-position	0.01 to 1.00	mm	Depends on robot type	-
10	JOG speed	1 to 100	%	100	-
11	Inching width	0.01 to 1.00	mm	1.00	-

- **Return-to-origin**

No.	Name	Setting / Setting Range	Units	Default	Restart
13	Origin speed	0.01 to 100.00	mm/s	20.00	-
14	Origin dir.	0: CCW direction; 1: CW direction	-	Depends on robot type	-

2.1.2 I/O parameters

- **Function selection**

No.	Name	Setting / Setting Range	Units	Default	Restart
31	SERVO sequence	0: Edge 1: Level	-	0	-
33	Input filter	1 to 10	ms	2	-

2.1.3 Option parameters

• **Pulse train**

No.	Name	Setting / Setting Range	Units	Default	Restart
83	Pulse train input type	0: Pulse train invalid * 1: Open collector CW/CCW 2: Open collector Pulse/Sign 3: Open collector Phase A/Phase B 5: Line driver CW/CCW 6: Line driver Pulse/Sign 7: Line driver Phase A/Phase B	-	0	Required
84	E-Gear 1	1 to 32767	-	20480	Required
85	E-Gear 2	1 to 32767	-	Depends on robot type	Required

* These parameters are set when the JOG operation, inching operation or return-to-origin is started from the support software (RS-Manager).

2.1.4 Servo parameters

• **Adjustment (for user adjustments)**

No.	Name	Setting / Setting Range	Units	Default	Restart
76	Payload 1 (JOG operation only)	0 to value depending on robot type	kg	Depends on robot type	
77	Max. payload accel.1 *1 (Depends on robot type)	0.01 to value depending on robot type	m/s^2	Depends on robot type	

* The values shown above are changed according to the specified calculation formula when registering the parameter K76.

2.2 Parameter details

The parameters described below can be adjusted to conform to the actual application and usage conditions.

WARNING

BEFORE CHANGING THE PARAMETERS, MAKE SURE THAT THE SERVO IS TURNED OFF AND THE PULSE TRAIN COMMAND INPUT FROM THE HOST UNIT IS STOPPED COMPLETELY. FAILURE TO DO SO MAY CAUSE AN UNEXPECTED OPERATION.

2.2.1 RUN parameters

• **Positioning related parameters**

		Setting Range	Default	Units	Restar
K1 K2	Soft limit (-) (JOG operation only) Soft limit (+) (JOG operation only)	-9999.99 to 9999.99	Depends on robot type	mm	-

Function

Specifies the robot movement range when the JOG operation is started from the support software (RS-Manager). K1 specifies the minus-side limit, and K2 specifies the plus-side limit.
Although the robot's effective stroke was factory-set as the soft limit at shipment, it should be changed if necessary to avoid collisions with obstacles, etc. only when the return-to-origin has been completed.

TIP

For the plus and minus directions, the robot motor side becomes the minus direction and the side opposite to the motor becomes the plus direction.

		Setting Range	Default	Units	Restart
K3	In-position	0.01 to 1.00	Depends on robot type	mm	-

Function

When the value (accumulated pulse) that the current position (feedback pulse) is subtracted from the command pulse exists in a range specified by this parameter, the IN-POS of the I/O becomes ON.

TIP

The IN-POS signal may continue ON if this value is large or depending on the movement speed.

K10	JOG speed	Setting Range	Default	Units	Restart
		1 to 100	100	%	-

Function

Specifies the JOG movement speed when the JOG movement is started from the support software (RS-Manager). A setting of 100% is 100mm/s.

K11	Inching width	Setting Range	Default	Units	Restart
		0.01 to 1.00	0.01	mm	-

Function

Specifies the inching amount when the inching movement is started from the support software (RS-Manager).

• Return-to-origin related parameters

K13	Return-to-origin speed	Setting Range	Default	Units	Restart
		0.01 to 100.00	Depends on robot type	mm/s	-

Function

Specifies the return-to-origin movement speed.

CAUTION

If a large value is set for the parameter "Origin speed" (K13), the alarm 89, "POSITION ERROR", may occur during return-to-origin. If this happens, adjust the parameter to decrease "Origin speed" (K13).

K14	Return-to-origin direction	Setting Range	Default	Units	Restart
		0 to 1	Depends on robot type	-	-

Function

Specifies the return-to-origin direction.

Settings

Setting Value	Description
0	CCW
1	CW

2.2.2 I/O parameters

• Function selection related parameters

K31	SERVO sequence	Setting Range	Default	Units	Restart
		0 to 1	0	-	-

Function

Specifies the SERVO input's servo ON/OFF conditions.

Settings

Setting Value	Description
0	Edge (servo ON at leading edge, servo OFF at trailing edge)
1	Level (ON: servo on; OFF: servo off)

CAUTION

Even when the "Pulse train input type" (K83) is set invalid if the SERVO sequence is set at level, the servo cannot be turned on from the support software (RS-Manager).
To turn on the servo from the RS-Manager, set this parameter to edge.

K33	Input filter	Setting Range	Default	Units	Restart
		1 to 10	2	ms	-

Function

Specifies the filter processing time for inputs from the host unit. The larger the setting value, the longer the filtering time, and the slower the response to the input (except for the command pulse input and commend direction input).

2.2.3 Option parameters

Pulse train

K83	Pulse train input type	Setting Range	Default	Units	Restart
		0 to 7 (except for 4)	0	-	Required

Function

Specifies the pulse train command input type. When this parameter is set at "0", the JOG operation, inching operation, or return-to-origin can be started from the support software (RS-Manager).

Settings

Setting Value	Description
0	Pulse train invalid
1	CW/CCW (Open collector)
2	Pulse/Sign (Open collector)
3	Phase A/Phase B (Open collector)
5	CW/CCW (Line driver)
6	Pulse/Sign (Line driver)
7	Phase A/Phase B (Line driver)

CAUTION

When this parameter is set at "0", the return-to-origin is not started even when the return-to-origin I/O input is turned ON during JOG or inching operation. Additionally, the JOG or inching operation is not started from the RS-Manager while the return-to-origin input is ON.

K84	E-Gear 1	Setting Range	Default	Units	Restart
		1 to 32767	20480	-	Required

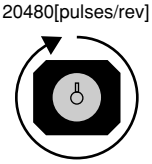
K85	E-Gear 2	Setting Range	Default	Units	Restart
		1 to 32767	Depends on robot type	-	Required

Function

Specifies the movement amount (pulse rate) per command pulse.
"E-Gear 1" (K84) means the numerator of the E-Gear ratio while "E-Gear 2" (K85) means its denominator.
The lead (μm) of the robot you have selected is specified for "E-Gear 2" (K85) as initial value.

TIP

In the P1, the resolution of the robot position detection unit is 20480 pulses.



The movement amount per command pulse is calculated from the formula shown below.

$$\text{Movement amount per command pulse (mm/pulse)} = \frac{\text{Lead length (mm/rev)}}{\text{20480 (pulses/rev)}} \times \text{E-Gear ratio}$$

When the lead of the robot is 6 mm and the E-Gear ratio is "1", the robot movement distance per command pulse is as follows.

$$\text{Movement amount per command pulse (mm/pulse)} = \frac{\text{6 (mm/rev)}}{\text{20480 (pulses/rev)}} \times 1$$

$$\fallingdotseq 0.293 \times 10^{-3} \text{ (mm)}$$

According to the above, the design of the E-Gear ratio is calculated from the formula shown below.

$$\text{E-Gear ratio} = \text{Movement amount per command pulse (mm/pulse)} \times \frac{\text{20480 (pulses/rev)}}{\text{Lead length (mm/rev)}}$$

The E-Gear ratio necessary to move the robot, which has a lead of 6 mm, 0.01 mm by one command pulse is calculated as follows.

$$\text{E-Gear ratio} = 0.01 \text{ (mm/pulse)} \times \frac{\text{20480 (pulses/rev)}}{\text{6 (mm/rev)}}$$

$$= \frac{1}{100} \text{ (mm/pulse)} \times \frac{\text{20480 (pulses/rev)}}{\text{6 (mm/rev)}}$$

$$= \frac{20480}{600}$$

So, set "20480" for "E-Gear 1" and "600" for "E-Gear 2".

2.2.4 Servo parameters

■ Adjustment (for user adjustments)

K76	Payload 1 (JOG operation only)	Setting Range	Default	Units	Restart
		0 to ... (depends on robot type)	Depends on robot type	kg	-

Function

Specifies the maximum weight of objects (tools, workpieces, etc.) which can be mounted on the robot. According to this setting, the max. payload acceleration suitable for the JOG operation is automatically set for "Max. payload accel. 1".

CAUTION

If a value smaller than the actual payload is set, vibration or heating may occur, causing a malfunction. Additionally, this may also shorten the robot life. So, be sure to set an appropriate value suitable for the actual payload.

K77	Max. payload accel. 1 (JOG operation only)	Setting Range	Default	Units	Restart
		-	2	m/s^2	-

Function

Specifies the maximum payload acceleration defined by the "Payload 1" (K76) parameter. This is a "read only" parameter.

WARNING

THIS SET VALUE APPLIES TO THE JOG OPERATION. WHEN DESIGNING THE MOVEMENT COMMAND USING THE PULSE TRAIN IN THE HOST UNIT, DESIGN THE MOVEMENT COMMAND SO THAT IT DOES NOT EXCEED THE ACCELERATION SPECIFIED BY THIS PARAMETER.

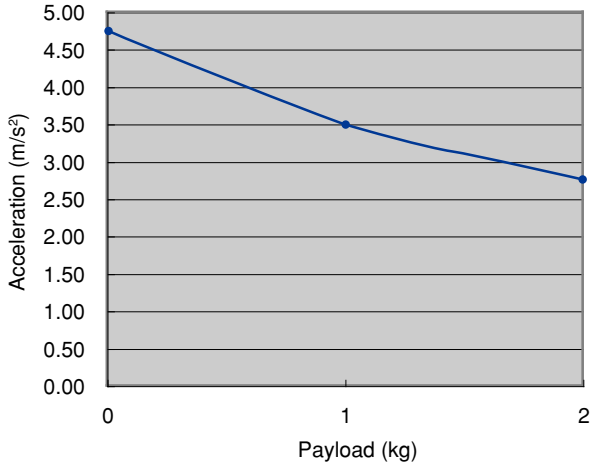
3. Reference graphs and tables of speed and acceleration settings using payload and stroke

This section shows the reference graph and table of the speed and acceleration settings using the payload and stroke by model.
Set appropriate max. speed and acceleration suitable for the payload while referring to relevant graphs and tables.

3.1 Slider type

Model	RS112

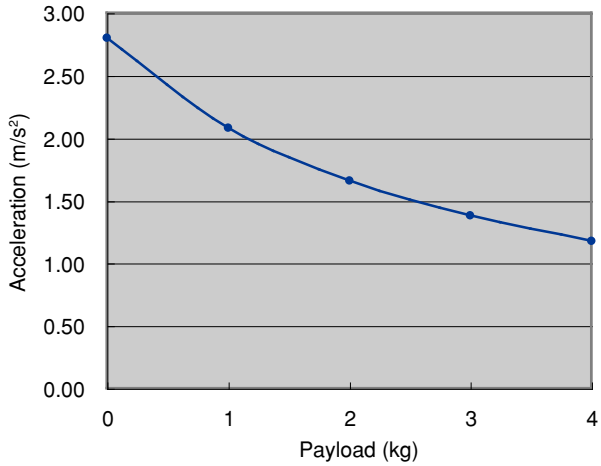
Max. speed: 600mm/s



Payload (kg)	Acceleration (m/s²)
0	4.76
1	3.50
2	2.76

Model	RS106

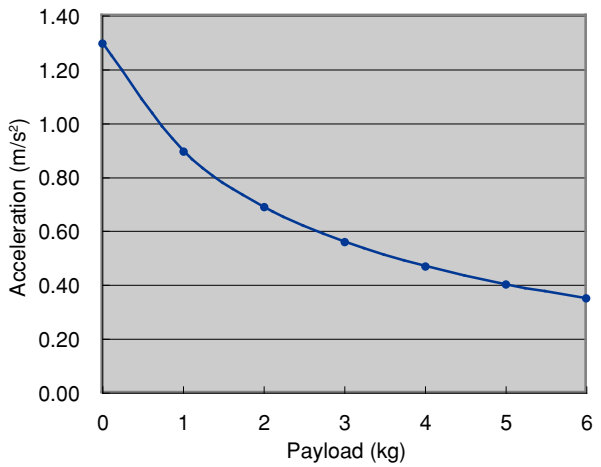
Max. speed: 300mm/s



Payload (kg)	Acceleration (m/s²)
0	2.80
1	2.08
2	1.66
3	1.38
4	1.18

Model	RS102

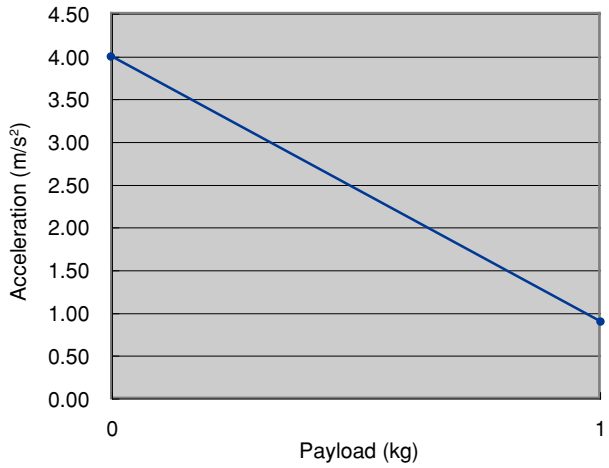
Max. speed: 100mm/s



Payload (kg)	Acceleration (m/s²)
0	1.30
1	0.90
2	0.69
3	0.56
4	0.47
5	0.40
6	0.35

Model	RS112B

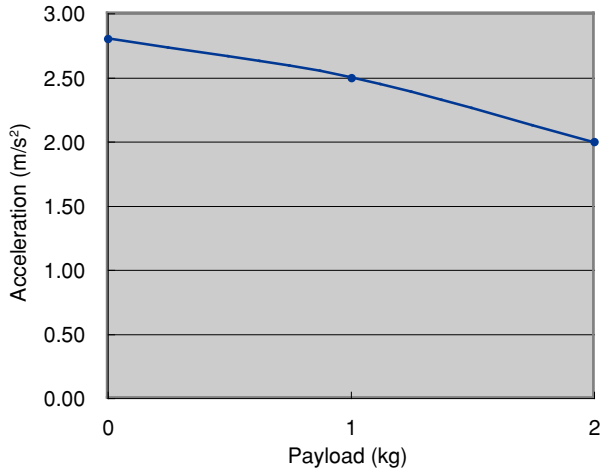
Max. speed: 600mm/s



Payload (kg)	Acceleration (m/s²)
0	4.00
1	0.90

Model	RS106B

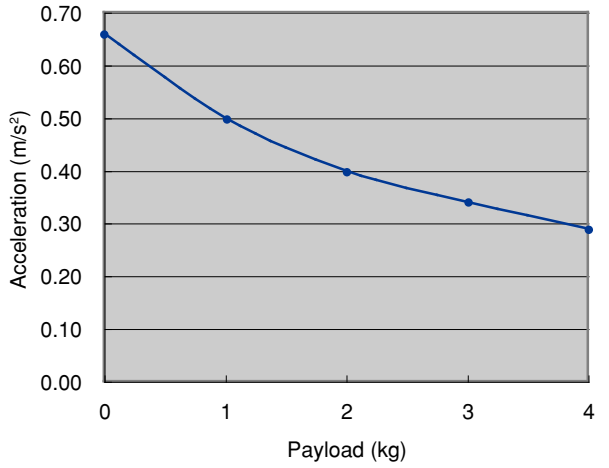
Max. speed: 300mm/s



Payload (kg)	Acceleration (m/s²)
0	2.80
1	2.50
2	1.99

Model	RS102B

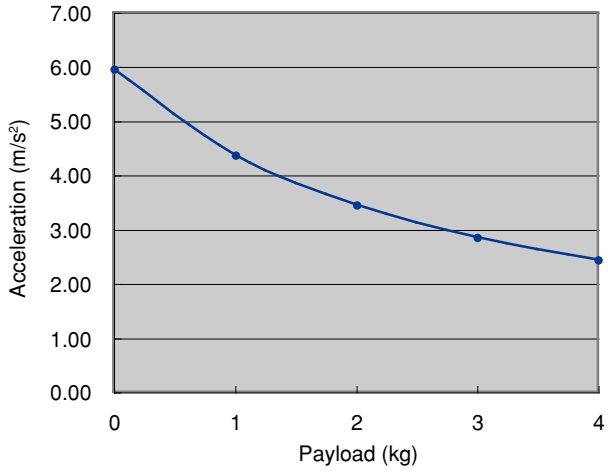
Max. speed: 100mm/s



Payload (kg)	Acceleration (m/s²)
0	0.66
1	0.50
2	0.40
3	0.34
4	0.29

Model	RS220

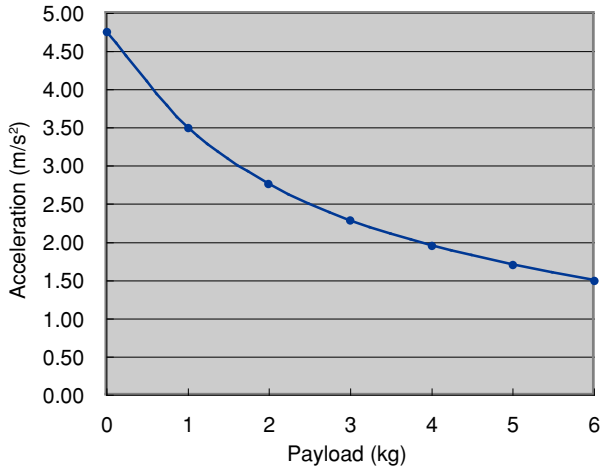
Max. speed: 1000 mm/s (Stroke is 50 mm to 600 mm.)
Max. speed: 933 mm/s (Stroke is 650 mm.)
Max. speed: 833mm/s (Stroke is 700mm.)
Max. speed: 733mm/s (Stroke is 750mm.)
Max. speed: 633mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s^2)
0	5.96
1	4.38
2	3.46
3	2.86
4	2.44

Model	RS212

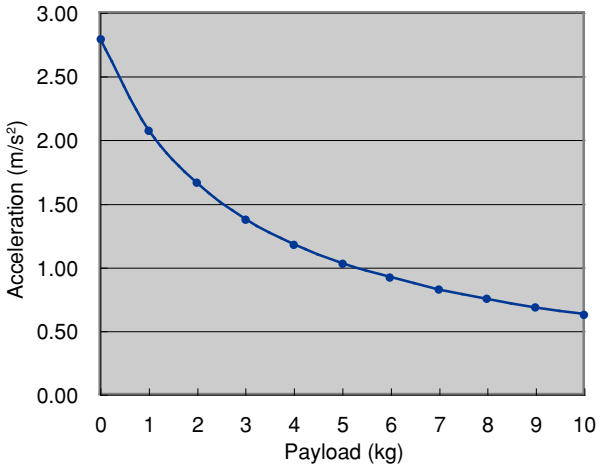
Max. speed: 600mm/s (Stroke is 50mm to 600mm.)
Max. speed: 560mm/s (Stroke is 650mm.)
Max. speed: 500mm/s (Stroke is 700mm.)
Max. speed: 440mm/s (Stroke is 750mm.)
Max. speed: 380mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s^2)
0	4.76
1	3.50
2	2.76
3	2.28
4	1.95
5	1.70
6	1.50

Model	RS206

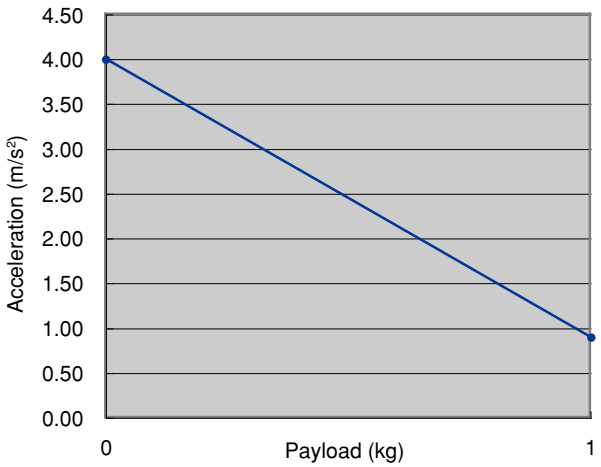
Max. speed: 300mm/s (Stroke is 50mm to 600mm.)
Max. speed: 280mm/s (Stroke is 650mm.)
Max. speed: 250mm/s (Stroke is 700mm.)
Max. speed: 220mm/s (Stroke is 750mm.)
Max. speed: 190mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s²)
0	2.80
1	2.08
2	1.66
3	1.38
4	1.18
5	1.03
6	0.92
7	0.82
8	0.75
9	0.68
10	0.63

Model	RS212B

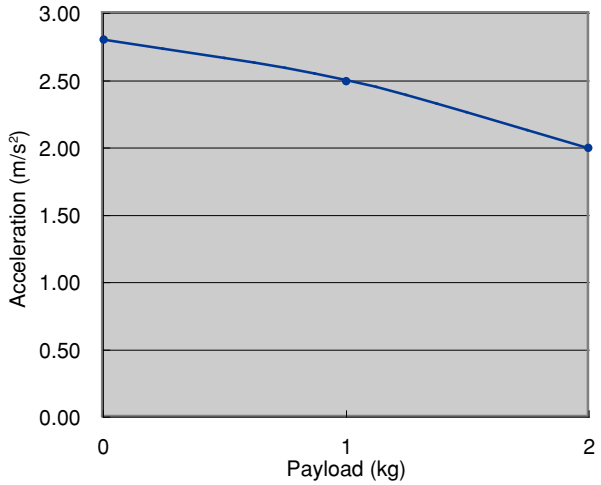
Max. speed: 600mm/s (Stroke is 50mm to 600mm.)
Max. speed: 560mm/s (Stroke is 650mm.)
Max. speed: 500mm/s (Stroke is 700mm.)
Max. speed: 440mm/s (Stroke is 750mm.)
Max. speed: 380mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s²)
0	4.00
1	0.90

Model	RS206B

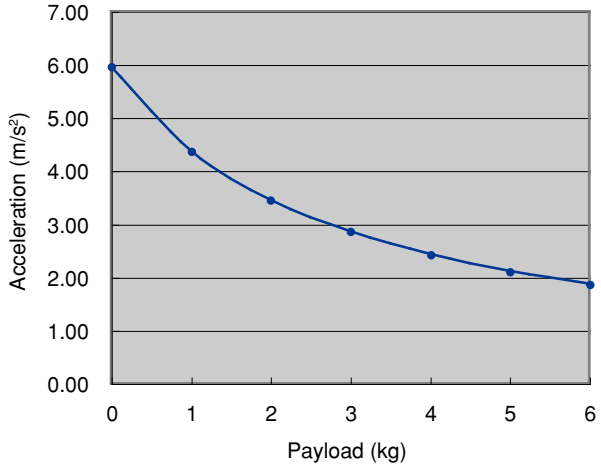
Max. speed: 300mm/s (Stroke is 50mm to 600mm.)
Max. speed: 280mm/s (Stroke is 650mm.)
Max. speed: 250mm/s (Stroke is 700mm.)
Max. speed: 220mm/s (Stroke is 750mm.)
Max. speed: 190mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s^2)
0	2.80
1	2.50
2	1.99

Model	RS320

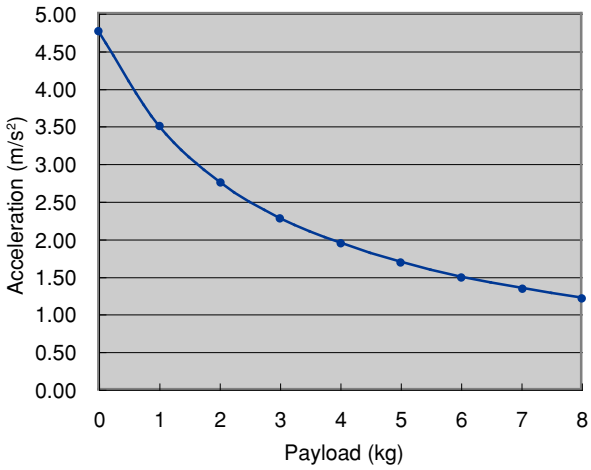
Max. speed: 1000mm/s (Stroke is 50mm to 600mm.)
Max. speed: 933mm/s (Stroke is 650mm.)
Max. speed: 833mm/s (Stroke is 700mm.)
Max. speed: 733mm/s (Stroke is 750mm.)
Max. speed: 633mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s^2)
0	5.96
1	4.38
2	3.46
3	2.86
4	2.44
5	2.12
6	1.88

Model	RS312

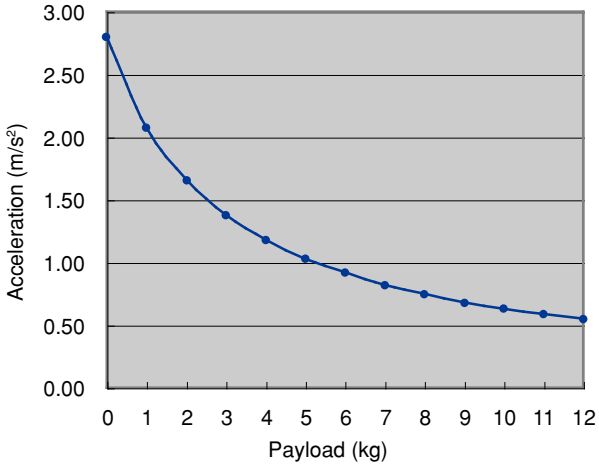
Max. speed: 600mm/s (Stroke is 50mm to 600mm.)
Max. speed: 560mm/s (Stroke is 650mm.)
Max. speed: 500mm/s (Stroke is 700mm.)
Max. speed: 440mm/s (Stroke is 750mm.)
Max. speed: 380mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s²)
0	4.76
1	3.50
2	2.76
3	2.28
4	1.95
5	1.70
6	1.50
7	1.35
8	1.22

Model	RS306

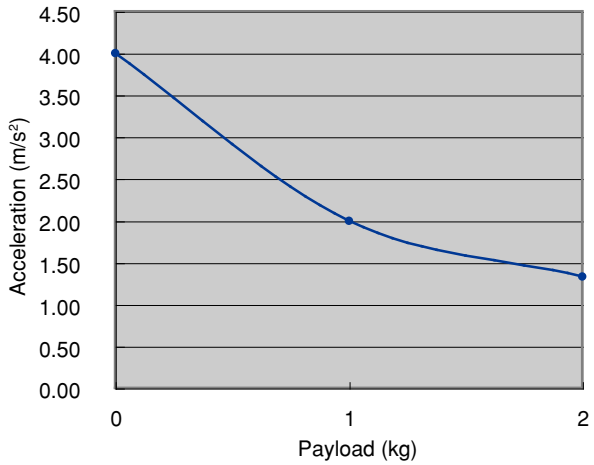
Max. speed: 300mm/s (Stroke is 50mm to 600mm.)
Max. speed: 280mm/s (Stroke is 650mm.)
Max. speed: 250mm/s (Stroke is 700mm.)
Max. speed: 220mm/s (Stroke is 750mm.)
Max. speed: 190mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s²)
0	2.80
1	2.08
2	1.66
3	1.38
4	1.18
5	1.03
6	0.92
7	0.82
8	0.75
9	0.68
10	0.63
11	0.59
12	0.55

Model	RS312B

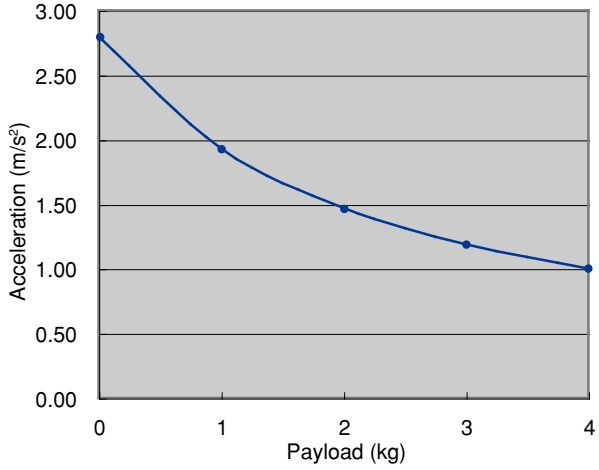
Max. speed: 500mm/s (Stroke is 50mm to 700mm.)
Max. speed: 440mm/s (Stroke is 750mm.)
Max. speed: 380mm/s (Stroke is 800mm.)



Payload (kg)	Acceleration (m/s^2)
0	4.00
1	2.00
2	1.33

Model	RS306B

Max. speed: 250mm/s (Stroke is 50mm to 700mm.)
Max. speed: 220mm/s (Stroke is 750mm.)
Max. speed: 190mm/s (Stroke is 800mm.)

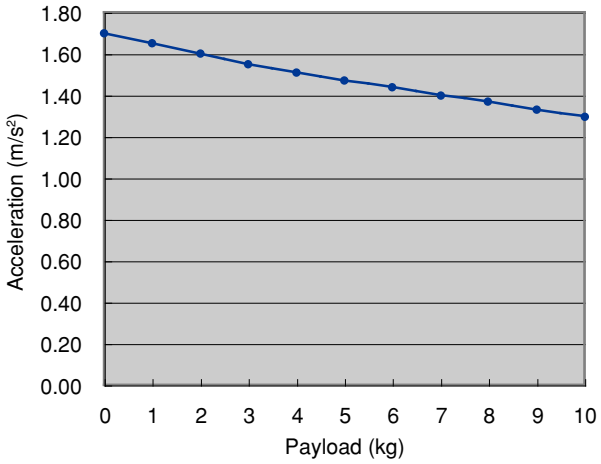


Payload (kg)	Acceleration (m/s^2)
0	2.80
1	1.93
2	1.47
3	1.19
4	1.00

3.2 Rod type (Standard)

Model	RSD112

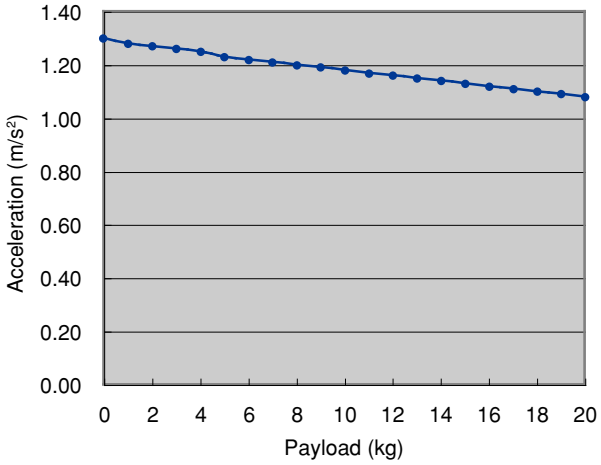
Max. speed: 500mm/s



Payload (kg)	Acceleration (m/s²)
0	1.70
1	1.65
2	1.60
3	1.55
4	1.51
5	1.47
6	1.44
7	1.40
8	1.37
9	1.33
10	1.30

Model	RSD106

Max. speed: 250mm/s

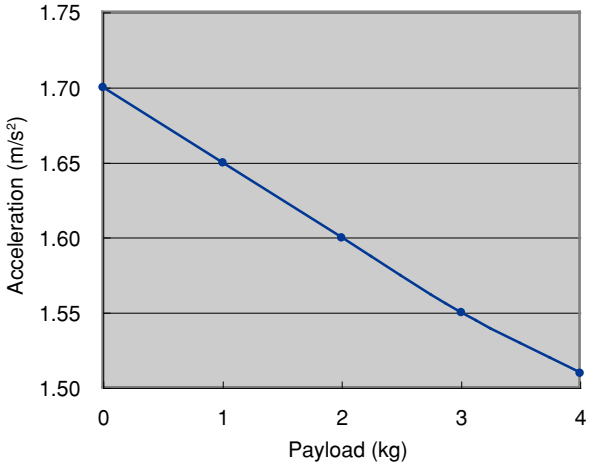


Payload (kg)	Acceleration (m/s²)
0	1.30
1	1.28
2	1.27
3	1.26
4	1.25
5	1.23
6	1.22
7	1.21
8	1.20
9	1.19
10	1.18

Payload (kg)	Acceleration (m/s²)
11	1.17
12	1.16
13	1.15
14	1.14
15	1.13
16	1.12
17	1.11
18	1.10
19	1.09
20	1.08

Model	RSD112B

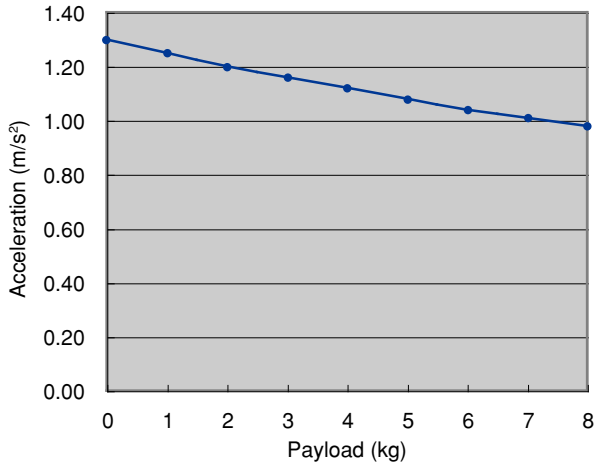
Max. speed: 500mm/s



Payload (kg)	Acceleration (m/s²)
0	1.70
1	1.65
2	1.60
3	1.55
4	1.51

Model	RSD106B

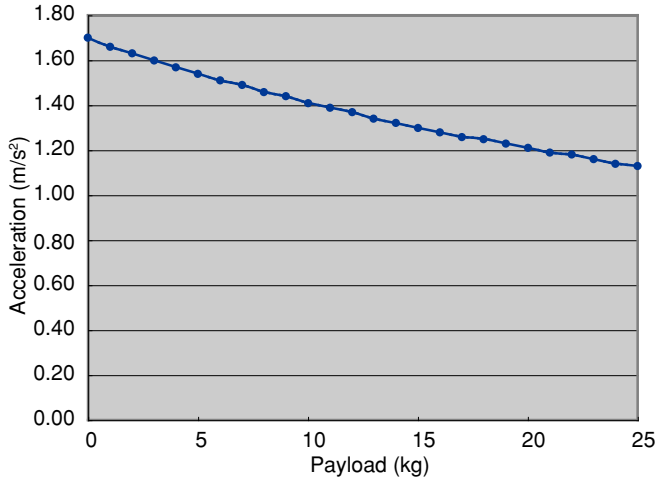
Max. speed: 500mm/s



Payload (kg)	Acceleration (m/s²)
0	1.30
1	1.25
2	1.20
3	1.16
4	1.12
5	1.08
6	1.04
7	1.01
8	0.98

Model	RSD212

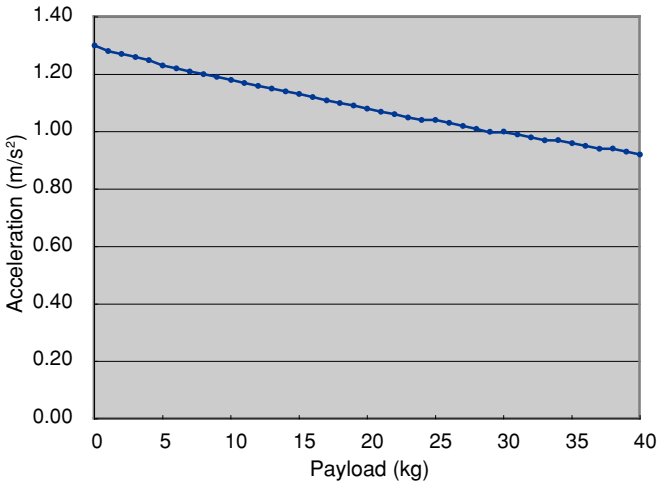
Max. speed: 500mm/s (Stroke is 50mm to 200mm.)
Max. speed: 440mm/s (Stroke is 250mm.)
Max. speed: 320mm/s (Stroke is 300mm.)



Payload (kg)	Acceleration (m/s²)
0	1.70
1	1.66
2	1.63
3	1.60
4	1.57
5	1.54
6	1.51
7	1.49
8	1.46
9	1.44
10	1.41
11	1.39
12	1.37
13	1.34
14	1.32
15	1.30
16	1.28
17	1.26
18	1.25
19	1.23
20	1.21
21	1.19
22	1.18
23	1.16
24	1.14
25	1.13

Model	RSD206

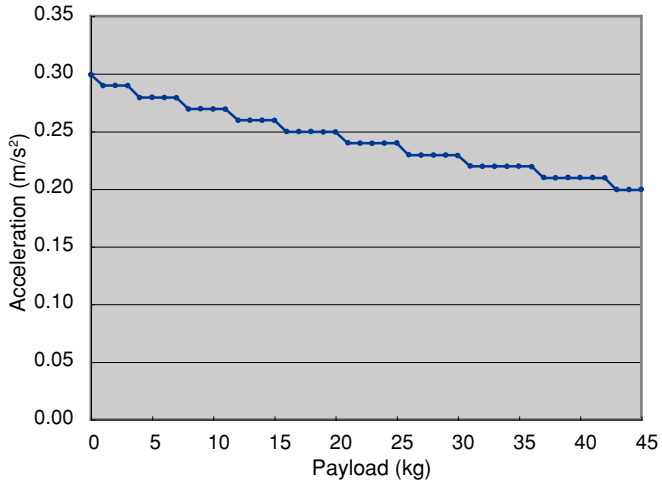
Max. speed: 250mm/s (Stroke is 50mm to 200mm.)
Max. speed: 220mm/s (Stroke is 250mm.)
Max. speed: 160mm/s (Stroke is 300mm.)



Payload (kg)	Acceleration (m/s^2)
0	1.30
1	1.28
2	1.27
3	1.26
4	1.25
5	1.23
6	1.22
7	1.21
8	1.20
9	1.19
10	1.18
11	1.17
12	1.16
13	1.15
14	1.14
15	1.13
16	1.12
17	1.11
18	1.10
19	1.09
20	1.08
21	1.07
22	1.06
23	1.05
24	1.04
25	1.04
26	1.03
27	1.02
28	1.01
29	1.00
30	1.00
31	0.99
32	0.98
33	0.97
34	0.97
35	0.96
36	0.95
37	0.94
38	0.94
39	0.93
40	0.92

Model	RSD202

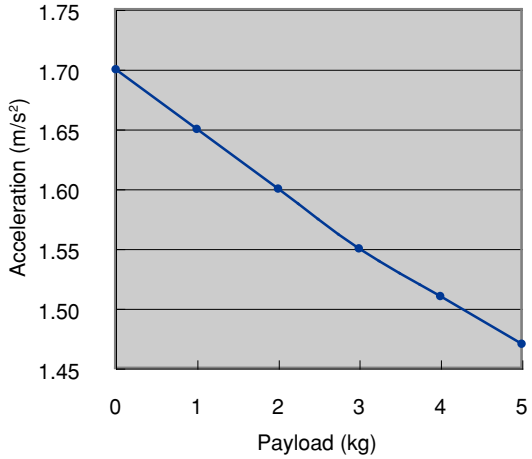
Max. speed: 80mm/s (Stroke is 50mm to 200mm.)
Max. speed: 72mm/s (Stroke is 250mm.)
Max. speed: 53mm/s (Stroke is 300mm.)



Payload (kg)	Acceleration (m/s²)	Payload (kg)	Acceleration (m/s²)
0	0.30	23	0.24
1	0.29	24	0.24
2	0.29	25	0.24
3	0.29	26	0.23
4	0.28	27	0.23
5	0.28	28	0.23
6	0.28	29	0.23
7	0.28	30	0.23
8	0.27	31	0.22
9	0.27	32	0.22
10	0.27	33	0.22
11	0.27	34	0.22
12	0.26	35	0.22
13	0.26	36	0.22
14	0.26	37	0.21
15	0.26	38	0.21
16	0.25	39	0.21
17	0.25	40	0.21
18	0.25	41	0.21
19	0.25	42	0.21
20	0.25	43	0.20
21	0.24	44	0.20
22	0.24	45	0.20

Model	RSD212B

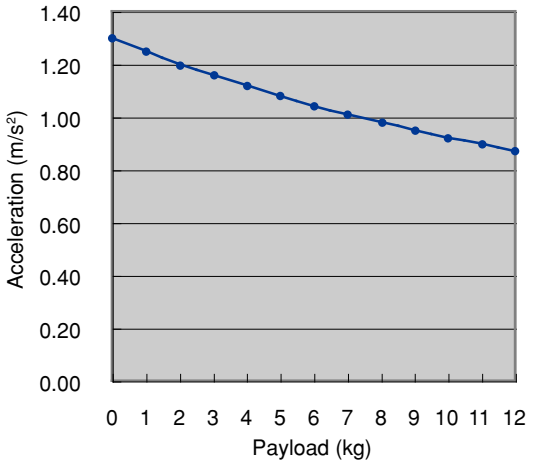
Max. speed: 500mm/s (Stroke is 50mm to 200mm.)
Max. speed: 440mm/s (Stroke is 250mm.)
Max. speed: 320mm/s (Stroke is 300mm.)



Payload (kg)	Acceleration (m/s²)
0	1.70
1	1.65
2	1.60
3	1.55
4	1.51
5	1.47

Model	RSD206B

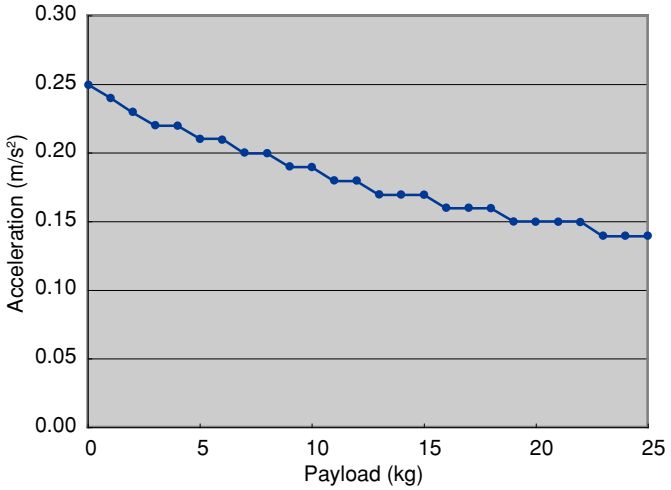
Max. speed: 250mm/s (Stroke is 50mm to 200mm.)
Max. speed: 220mm/s (Stroke is 250mm.)
Max. speed: 160mm/s (Stroke is 300mm.)



Payload (kg)	Acceleration (m/s^2)
0	1.30
1	1.25
2	1.20
3	1.16
4	1.12
5	1.08
6	1.04
7	1.01
8	0.98
9	0.95
10	0.92
11	0.90
12	0.87

Model	RSD202B

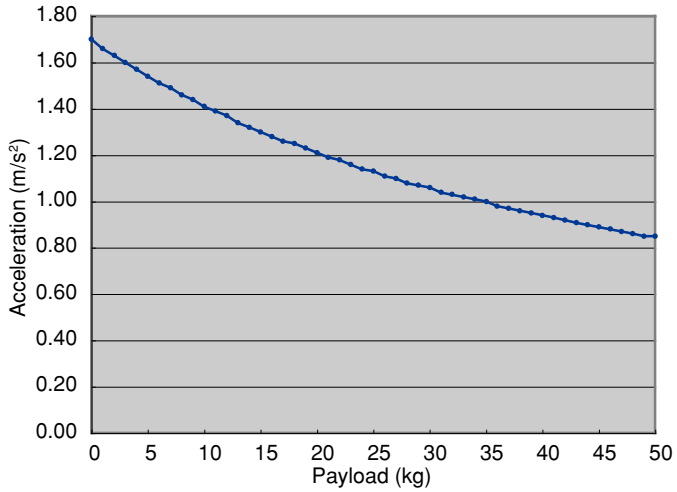
Max. speed: 80mm/s (Stroke is 50mm to 200mm.)
Max. speed: 72mm/s (Stroke is 250mm.)
Max. speed: 53mm/s (Stroke is 300mm.)



Payload (kg)	Acceleration (m/s^2)
0	0.25
1	0.24
2	0.23
3	0.22
4	0.22
5	0.21
6	0.21
7	0.20
8	0.20
9	0.19
10	0.19
11	0.18
12	0.18
13	0.17
14	0.17
15	0.17
16	0.16
17	0.16
18	0.16
19	0.15
20	0.15
21	0.15
22	0.15
23	0.14
24	0.14
25	0.14

Model	RSD312

Max. speed: 300mm/s

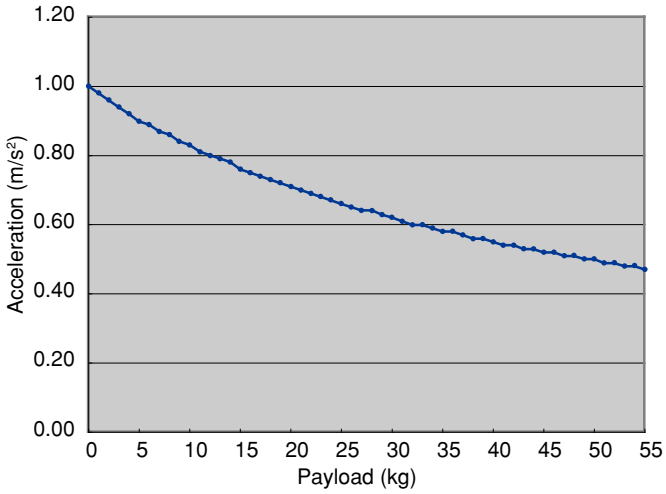


Payload (kg)	Acceleration (m/s²)
0	1.70
1	1.66
2	1.63
3	1.60
4	1.57
5	1.54
6	1.51
7	1.49
8	1.46
9	1.44
10	1.41
11	1.39
12	1.37
13	1.34
14	1.32
15	1.30
16	1.28
17	1.26
18	1.25
19	1.23
20	1.21
21	1.19
22	1.18
23	1.16
24	1.14
25	1.13

Payload (kg)	Acceleration (m/s²)
26	1.11
27	1.10
28	1.08
29	1.07
30	1.06
31	1.04
32	1.03
33	1.02
34	1.01
35	1.00
36	0.98
37	0.97
38	0.96
39	0.95
40	0.94
41	0.93
42	0.92
43	0.91
44	0.90
45	0.89
46	0.88
47	0.87
48	0.86
49	0.85
50	0.85

Model	RSD306

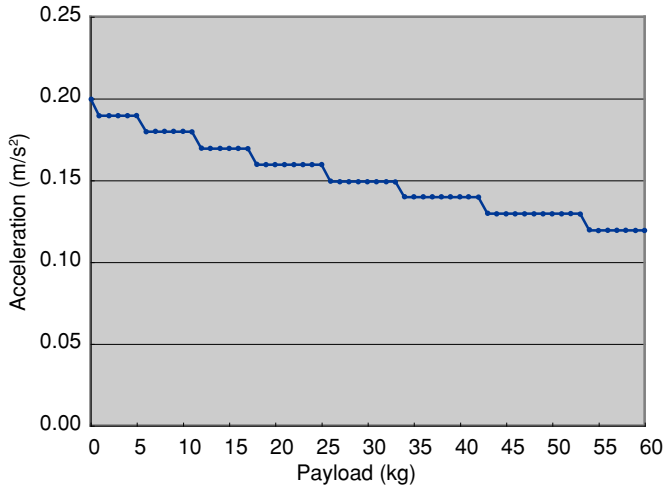
Max. speed: 150mm/s



Payload (kg)	Acceleration (m/s²)	Payload (kg)	Acceleration (m/s²)
0	1.00	28	0.64
1	0.98	29	0.63
2	0.96	30	0.62
3	0.94	31	0.61
4	0.92	32	0.60
5	0.90	33	0.60
6	0.89	34	0.59
7	0.87	35	0.58
8	0.86	36	0.58
9	0.84	37	0.57
10	0.83	38	0.56
11	0.81	39	0.56
12	0.80	40	0.55
13	0.79	41	0.54
14	0.78	42	0.54
15	0.76	43	0.53
16	0.75	44	0.53
17	0.74	45	0.52
18	0.73	46	0.52
19	0.72	47	0.51
20	0.71	48	0.51
21	0.70	49	0.50
22	0.69	50	0.50
23	0.68	51	0.49
24	0.67	52	0.49
25	0.66	53	0.48
26	0.65	54	0.48
27	0.64	55	0.47

Model	RSD302

Max. speed: 50mm/s

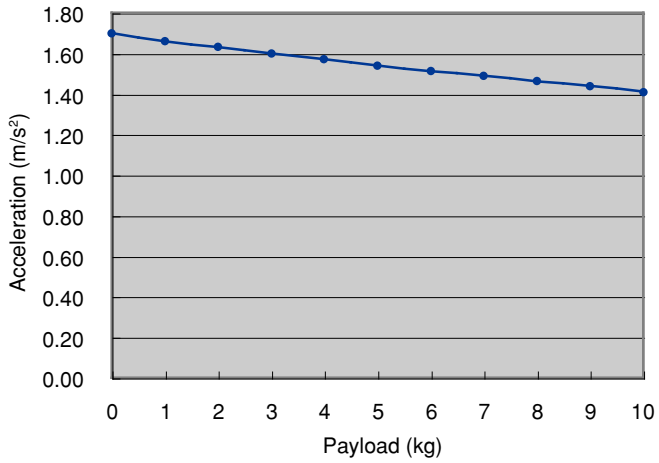


Payload (kg)	Acceleration (m/s²)
0	0.20
1	0.19
2	0.19
3	0.19
4	0.19
5	0.19
6	0.18
7	0.18
8	0.18
9	0.18
10	0.18
11	0.18
12	0.17
13	0.17
14	0.17
15	0.17
16	0.17
17	0.17
18	0.16
19	0.16
20	0.16
21	0.16
22	0.16
23	0.16
24	0.16
25	0.16
26	0.15
27	0.15
28	0.15
29	0.15
30	0.15

Payload (kg)	Acceleration (m/s²)
31	0.15
32	0.15
33	0.15
34	0.14
35	0.14
36	0.14
37	0.14
38	0.14
39	0.14
40	0.14
41	0.14
42	0.14
43	0.13
44	0.13
45	0.13
46	0.13
47	0.13
48	0.13
49	0.13
50	0.13
51	0.13
52	0.13
53	0.13
54	0.12
55	0.12
56	0.12
57	0.12
58	0.12
59	0.12
60	0.12

Model	RSD312B

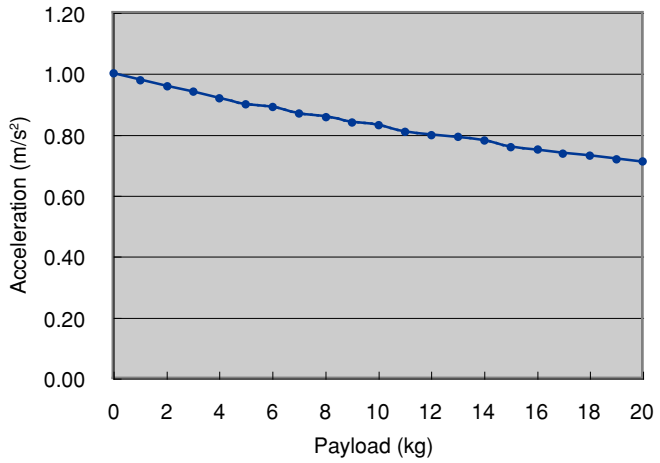
Max. speed: 300mm/s



Payload (kg)	Acceleration (m/s²)
0	1.70
1	1.66
2	1.63
3	1.60
4	1.57
5	1.54
6	1.51
7	1.49
8	1.46
9	1.44
10	1.41

Model	RSD306B

Max. speed: 150mm/s

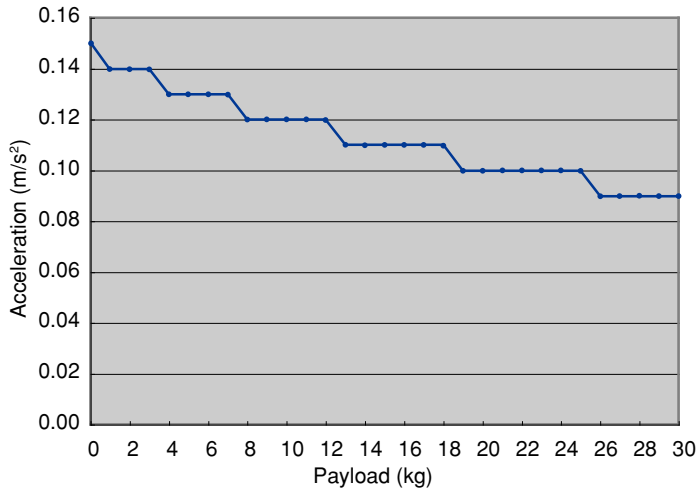


Payload (kg)	Acceleration (m/s^2)
0	1.00
1	0.98
2	0.96
3	0.94
4	0.92
5	0.90
6	0.89
7	0.87
8	0.86
9	0.84
10	0.83

Payload (kg)	Acceleration (m/s^2)
11	0.81
12	0.80
13	0.79
14	0.78
15	0.76
16	0.75
17	0.74
18	0.73
19	0.72
20	0.71

Model	RSD302B

Max. speed: 50mm/s



Payload (kg)	Acceleration (m/s^2)
0	0.15
1	0.14
2	0.14
3	0.14
4	0.13
5	0.13
6	0.13
7	0.13
8	0.12
9	0.12
10	0.12
11	0.12
12	0.12
13	0.11
14	0.11
15	0.11

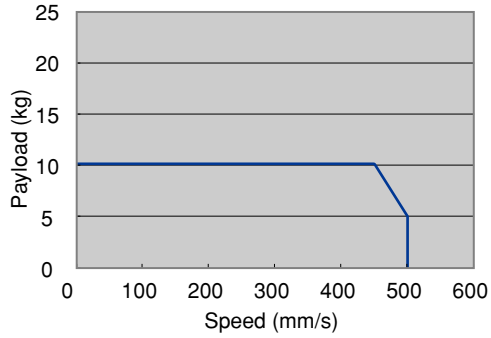
Payload (kg)	Acceleration (m/s^2)
16	0.11
17	0.11
18	0.11
19	0.10
20	0.10
21	0.10
22	0.10
23	0.10
24	0.10
25	0.10
26	0.09
27	0.09
28	0.09
29	0.09
30	0.09

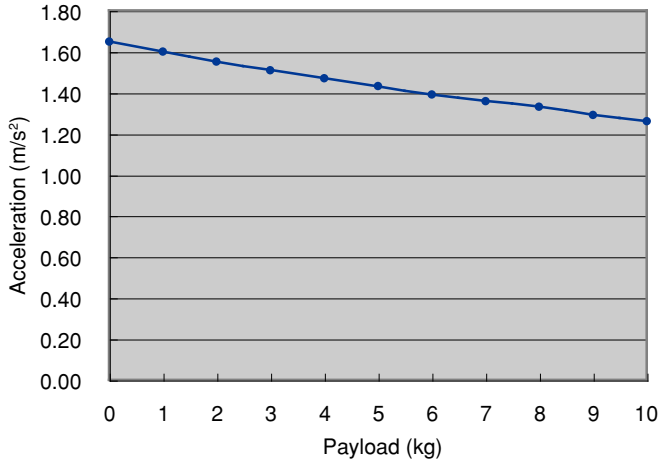
3.3 Rod type (With support guide)

Model	RSDG112

Max. speed: 500mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)



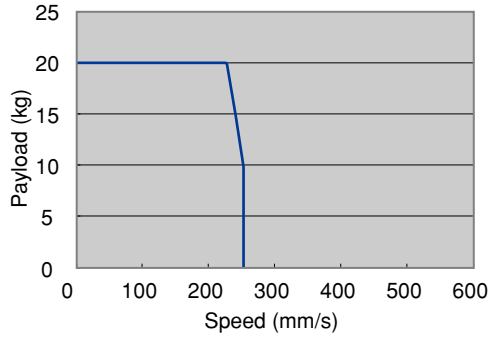


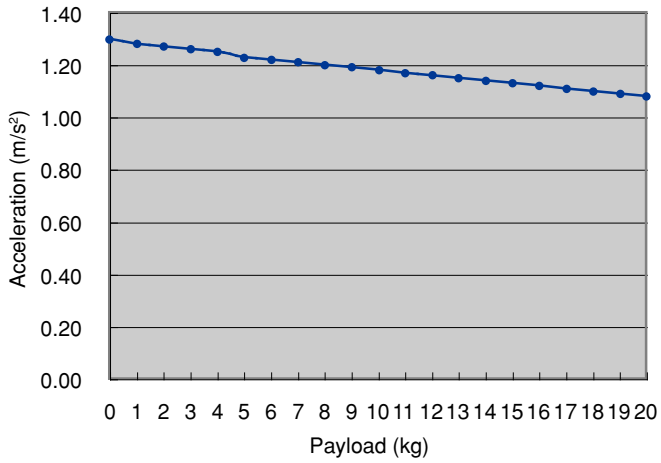
Payload (kg)	Acceleration (m/s²)
0	1.65
1	1.60
2	1.55
3	1.51
4	1.47
5	1.43
6	1.39
7	1.36
8	1.33
9	1.29
10	1.26

Model	RSDG106

Max. speed: 250mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)





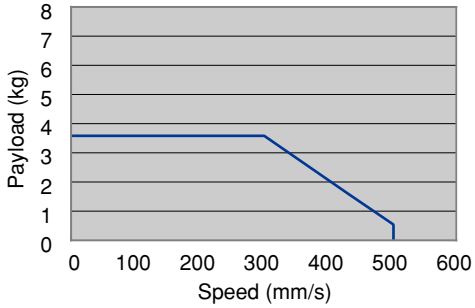
Payload (kg)	Acceleration (m/s²)
0	1.30
1	1.28
2	1.27
3	1.26
4	1.25
5	1.23
6	1.22
7	1.21
8	1.20
9	1.19
10	1.18

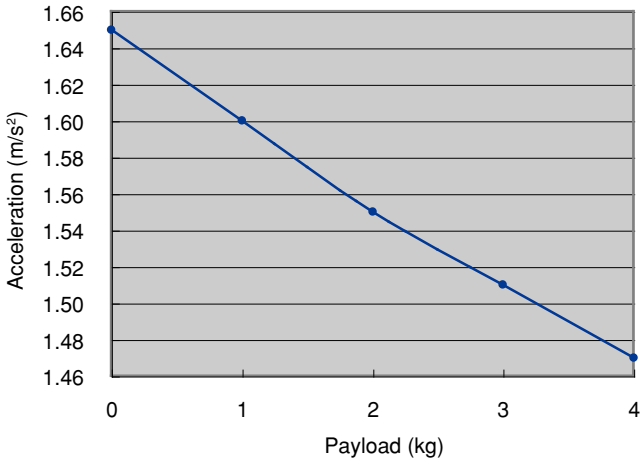
Payload (kg)	Acceleration (m/s²)
11	1.17
12	1.16
13	1.15
14	1.14
15	1.13
16	1.12
17	1.11
18	1.10
19	1.09
20	1.08

Model	RSDG112B

Max. speed: 500mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)



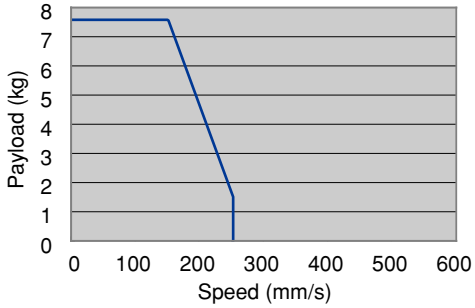


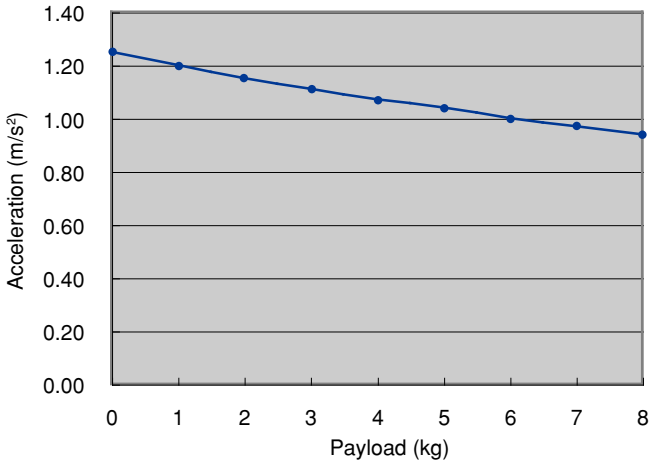
Payload (kg)	Acceleration (m/s^2)
0	1.65
1	1.60
2	1.55
3	1.51
4	1.47

Model	RSDG106B

Max. speed: 250mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)

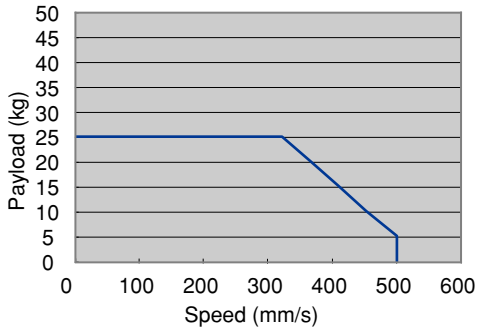


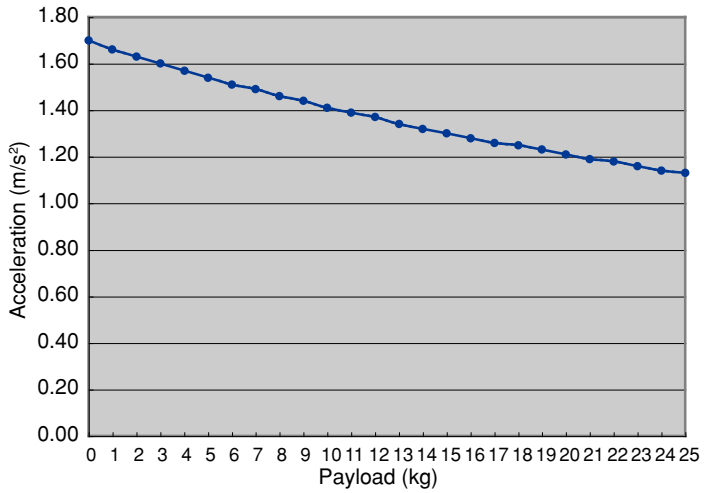


Payload (kg)	Acceleration (m/s^2)
0	1.25
1	1.20
2	1.15
3	1.11
4	1.07
5	1.04
6	1.00
7	0.97
8	0.94

Model	RSDG212

Max. speed: 500mm/s (Stroke is 50mm to 200mm.)
Max. speed: 440mm/s (Stroke is 250mm.)
Max. speed: 320mm/s (Stroke is 300mm.)
* The max. speed may vary depending on the payload. (See also the graphs shown below.)

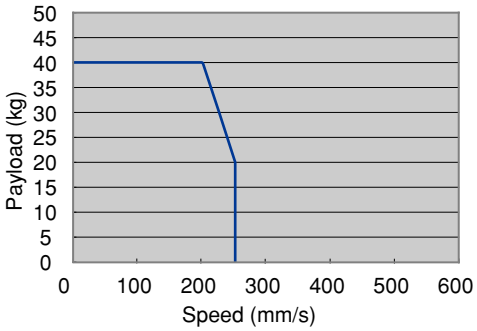


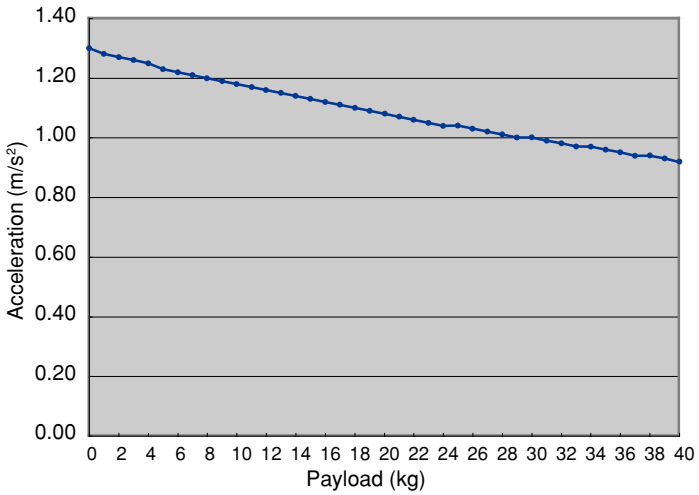


Payload (kg)	Acceleration (m/s^2)
0	1.70
1	1.66
2	1.63
3	1.60
4	1.57
5	1.54
6	1.51
7	1.49
8	1.46
9	1.44
10	1.41
11	1.39
12	1.37
13	1.34
14	1.32
15	1.30
16	1.28
17	1.26
18	1.25
19	1.23
20	1.21
21	1.19
22	1.18
23	1.16
24	1.14
25	1.13

Model	RSDG206

Max. speed: 250mm/s (Stroke is 50mm to 200mm.)
Max. speed: 220mm/s (Stroke is 250mm.)
Max. speed: 160mm/s (Stroke is 300mm.)
*The max. speed may vary depending on the payload. (See also the graphs shown below.)



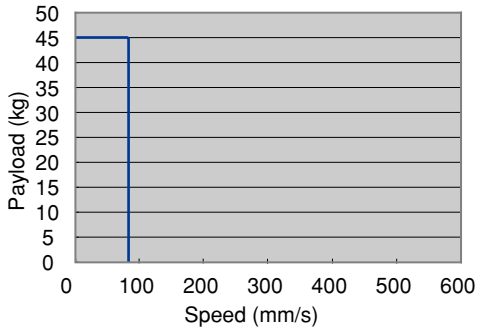


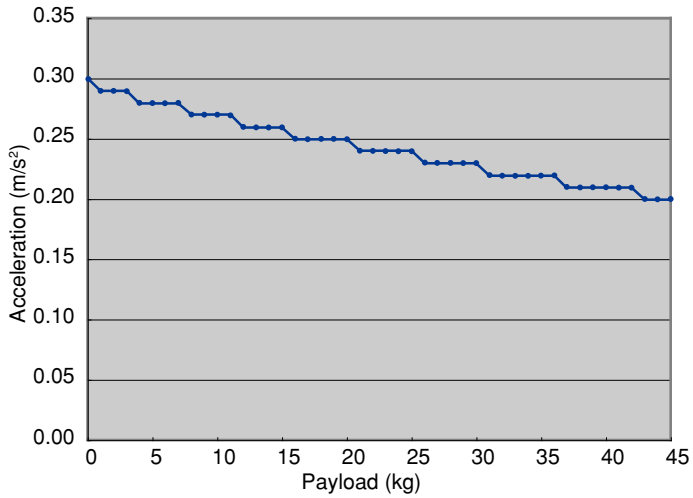
Payload (kg)	Acceleration (m/s^2)
0	1.30
1	1.28
2	1.27
3	1.26
4	1.25
5	1.23
6	1.22
7	1.21
8	1.20
9	1.19
10	1.18
11	1.17
12	1.16
13	1.15
14	1.14
15	1.13
16	1.12
17	1.11
18	1.10
19	1.09
20	1.08

Payload (kg)	Acceleration (m/s^2)
21	1.07
22	1.06
23	1.05
24	1.04
25	1.04
26	1.03
27	1.02
28	1.01
29	1.00
30	1.00
31	0.99
32	0.98
33	0.97
34	0.97
35	0.96
36	0.95
37	0.94
38	0.94
39	0.93
40	0.92

Model	RSDG202

Max. speed: 80mm/s (Stroke is 50mm to 200mm.)
Max. speed: 72mm/s (Stroke is 250mm.)
Max. speed: 53mm/s (Stroke is 300mm.)
* The max. speed may vary depending on the payload. (See also the graphs shown below.)

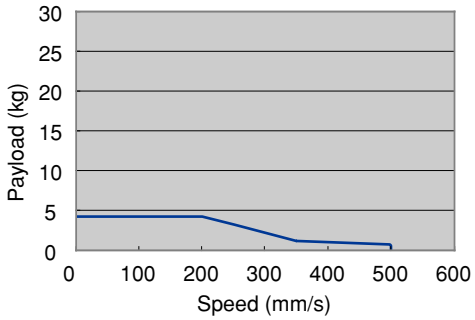


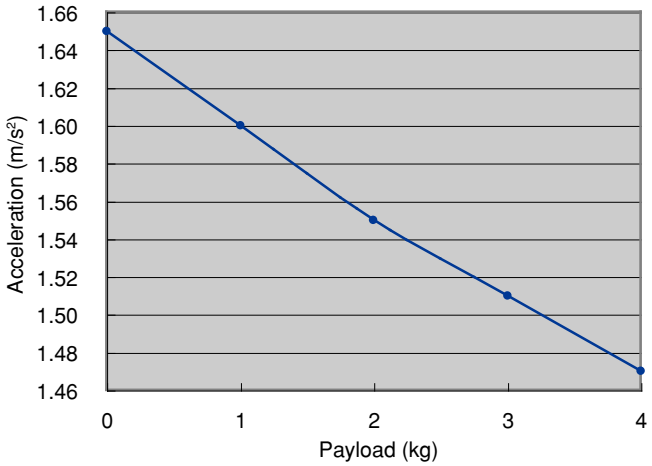


Payload (kg)	Acceleration (m/s^2)	Payload (kg)	Acceleration (m/s^2)
0	0.30	23	0.24
1	0.29	24	0.24
2	0.29	25	0.24
3	0.29	26	0.23
4	0.28	27	0.23
5	0.28	28	0.23
6	0.28	29	0.23
7	0.28	30	0.23
8	0.27	31	0.22
9	0.27	32	0.22
10	0.27	33	0.22
11	0.27	34	0.22
12	0.26	35	0.22
13	0.26	36	0.22
14	0.26	37	0.21
15	0.26	38	0.21
16	0.25	39	0.21
17	0.25	40	0.21
18	0.25	41	0.21
19	0.25	42	0.21
20	0.25	43	0.20
21	0.24	44	0.20
22	0.24	45	0.20

Model	RSDG212B

Max. speed: 500mm/s (Stroke is 50mm to 200mm.)
Max. speed: 440mm/s (Stroke is 250mm.)
Max. speed: 320mm/s (Stroke is 300mm.)
* The max. speed may vary depending on the payload. (See also the graphs shown below.)

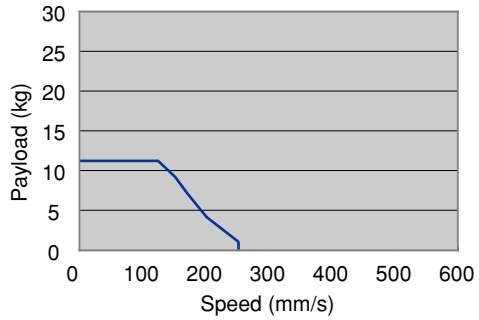


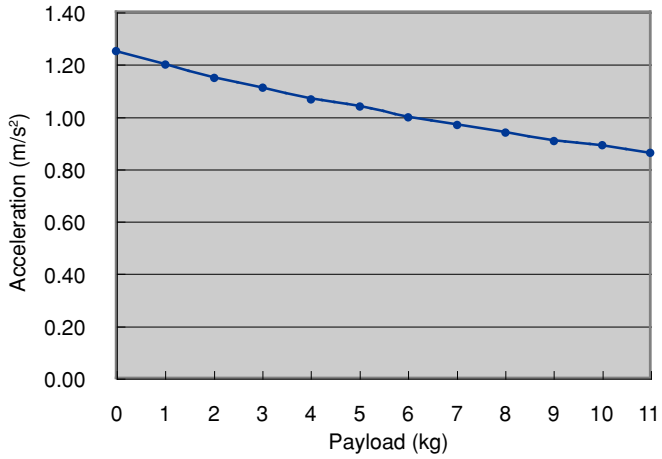


Payload (kg)	Acceleration (m/s^2)
0	1.65
1	1.60
2	1.55
3	1.51
4	1.47

Model	RSDG206B

Max. speed: 250mm/s (Stroke is 50mm to 200mm.)
Max. speed: 220mm/s (Stroke is 250mm.)
Max. speed: 160mm/s (Stroke is 300mm.)
* The max. speed may vary depending on the payload. (See also the graphs shown below.)

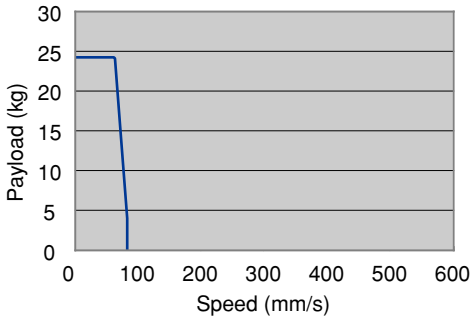


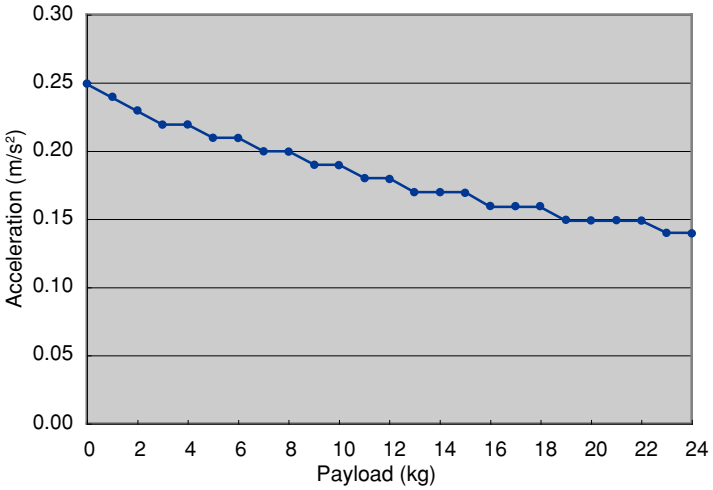


Payload (kg)	Acceleration (m/s^2)
0	1.25
1	1.20
2	1.15
3	1.11
4	1.07
5	1.04
6	1.00
7	0.97
8	0.94
9	0.91
10	0.89
11	0.86

Model	RSDG202B

Max. speed: 80mm/s (Stroke is 50mm to 200mm.)
Max. speed: 72mm/s (Stroke is 250mm.)
Max. speed: 53mm/s (Stroke is 300mm.)
* The max. speed may vary depending on the payload. (See also the graphs shown below.)



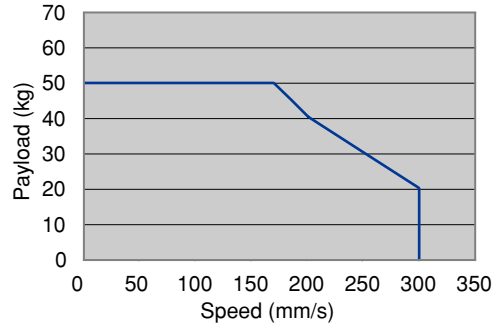


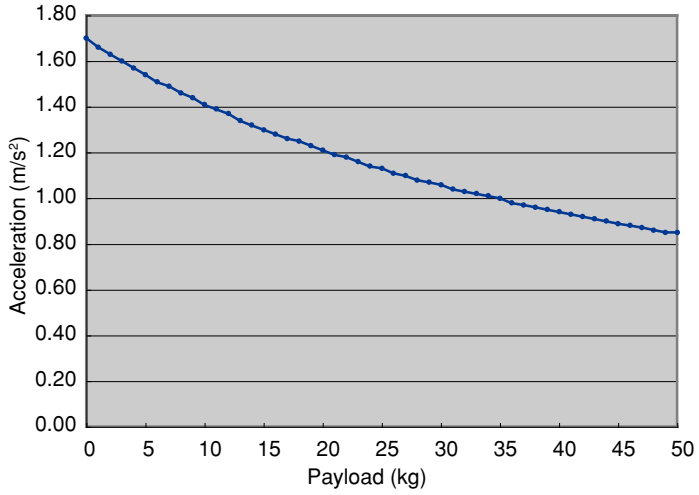
Payload (kg)	Acceleration (m/s^2)
0	0.25
1	0.24
2	0.23
3	0.22
4	0.22
5	0.21
6	0.21
7	0.20
8	0.20
9	0.19
10	0.19
11	0.18
12	0.18
13	0.17
14	0.17
15	0.17
16	0.16
17	0.16
18	0.16
19	0.15
20	0.15
21	0.15
22	0.15
23	0.14
24	0.14

Model	RSDG312

Max. speed: 300mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)





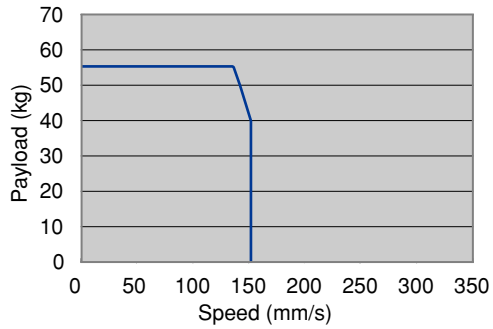
Payload (kg)	Acceleration (m/s^2)
0	1.70
1	1.66
2	1.63
3	1.60
4	1.57
5	1.54
6	1.51
7	1.49
8	1.46
9	1.44
10	1.41
11	1.39
12	1.37
13	1.34
14	1.32
15	1.30
16	1.28
17	1.26
18	1.25
19	1.23
20	1.21
21	1.19
22	1.18
23	1.16
24	1.14
25	1.13

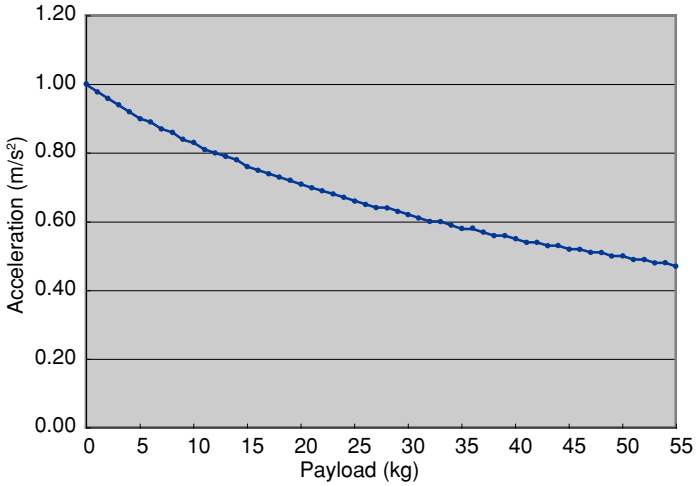
Payload (kg)	Acceleration (m/s^2)
26	1.11
27	1.10
28	1.08
29	1.07
30	1.06
31	1.04
32	1.03
33	1.02
34	1.01
35	1.00
36	0.98
37	0.97
38	0.96
39	0.95
40	0.94
41	0.93
42	0.92
43	0.91
44	0.90
45	0.89
46	0.88
47	0.87
48	0.86
49	0.85
50	0.85

Model	RSDG306

Max. speed: 150mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)



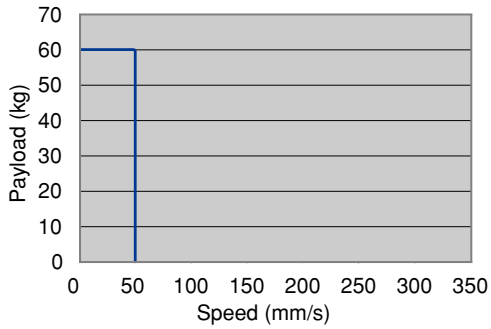


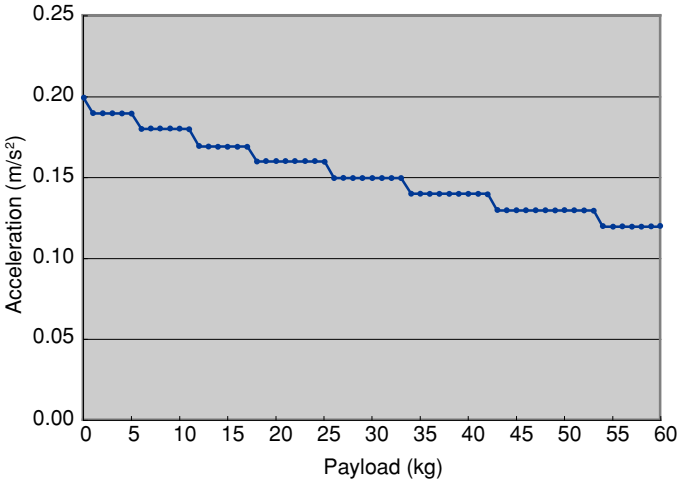
Payload (kg)	Acceleration (m/s²)	Payload (kg)	Acceleration (m/s²)
0	1.00	28	0.64
1	0.98	29	0.63
2	0.96	30	0.62
3	0.94	31	0.61
4	0.92	32	0.60
5	0.90	33	0.60
6	0.89	34	0.59
7	0.87	35	0.58
8	0.86	36	0.58
9	0.84	37	0.57
10	0.83	38	0.56
11	0.81	39	0.56
12	0.80	40	0.55
13	0.79	41	0.54
14	0.78	42	0.54
15	0.76	43	0.53
16	0.75	44	0.53
17	0.74	45	0.52
18	0.73	46	0.52
19	0.72	47	0.51
20	0.71	48	0.51
21	0.70	49	0.50
22	0.69	50	0.50
23	0.68	51	0.49
24	0.67	52	0.49
25	0.66	53	0.48
26	0.65	54	0.48
27	0.64	55	0.47

Model	RSDG302

Max. speed: 50mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)





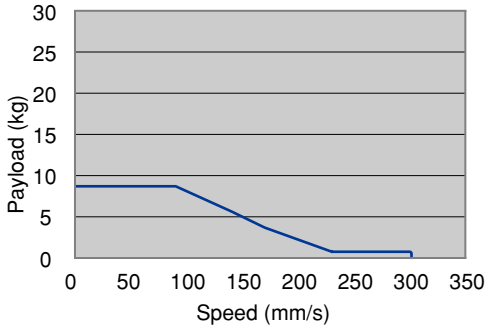
Payload (kg)	Acceleration (m/s²)
0	0.20
1	0.19
2	0.19
3	0.19
4	0.19
5	0.19
6	0.18
7	0.18
8	0.18
9	0.18
10	0.18
11	0.18
12	0.17
13	0.17
14	0.17
15	0.17
16	0.17
17	0.17
18	0.16
19	0.16
20	0.16
21	0.16
22	0.16
23	0.16
24	0.16
25	0.16
26	0.15
27	0.15
28	0.15
29	0.15
30	0.15

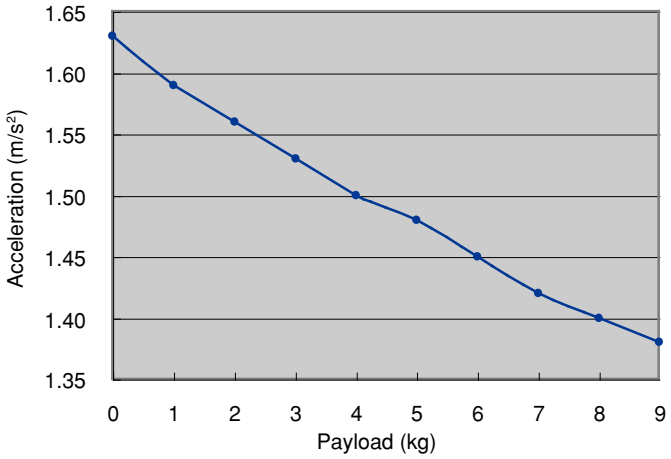
Payload (kg)	Acceleration (m/s²)
31	0.15
32	0.15
33	0.15
34	0.14
35	0.14
36	0.14
37	0.14
38	0.14
39	0.14
40	0.14
41	0.14
42	0.14
43	0.13
44	0.13
45	0.13
46	0.13
47	0.13
48	0.13
49	0.13
50	0.13
51	0.13
52	0.13
53	0.13
54	0.12
55	0.12
56	0.12
57	0.12
58	0.12
59	0.12
60	0.12

Model	RSDG312B

Max. speed: 300mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)



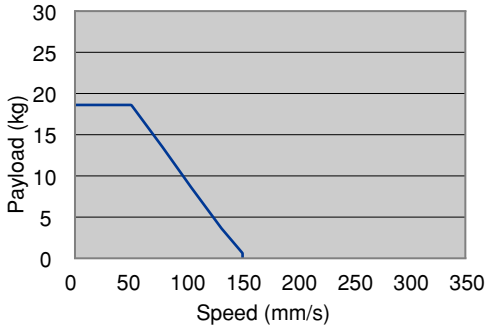


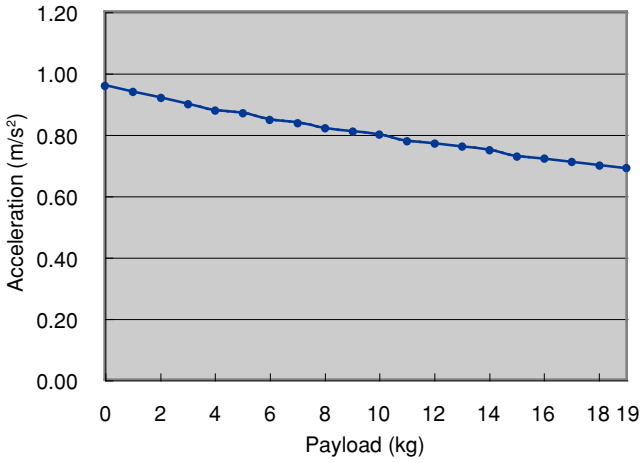
Payload (kg)	Acceleration (m/s^2)
0	1.63
1	1.59
2	1.56
3	1.53
4	1.50
5	1.48
6	1.45
7	1.42
8	1.40
9	1.38

Model	RSDG306B

Max. speed: 150mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)





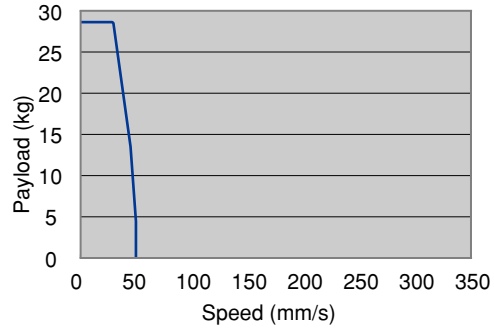
Payload (kg)	Acceleration (m/s^2)
0	0.96
1	0.94
2	0.92
3	0.90
4	0.88
5	0.87
6	0.85
7	0.84
8	0.82
9	0.81

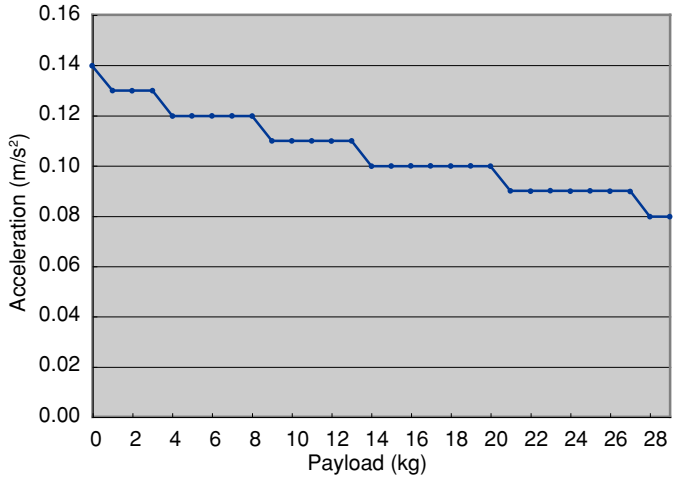
Payload (kg)	Acceleration (m/s^2)
10	0.80
11	0.78
12	0.77
13	0.76
14	0.75
15	0.73
16	0.72
17	0.71
18	0.70
19	0.69

Model	RSDG302B

Max. speed: 50mm/s

* The max. speed may vary depending on the payload. (See also the graphs shown below.)





Payload (kg)	Acceleration (m/s^2)
0	0.14
1	0.13
2	0.13
3	0.13
4	0.12
5	0.12
6	0.12
7	0.12
8	0.12
9	0.11
10	0.11
11	0.11
12	0.11
13	0.11
14	0.10
15	0.10
16	0.10
17	0.10
18	0.10
19	0.10
20	0.10
21	0.09
22	0.09
23	0.09
24	0.09
25	0.09
26	0.09
27	0.09
28	0.08
29	0.08

Chapter 5 Operation

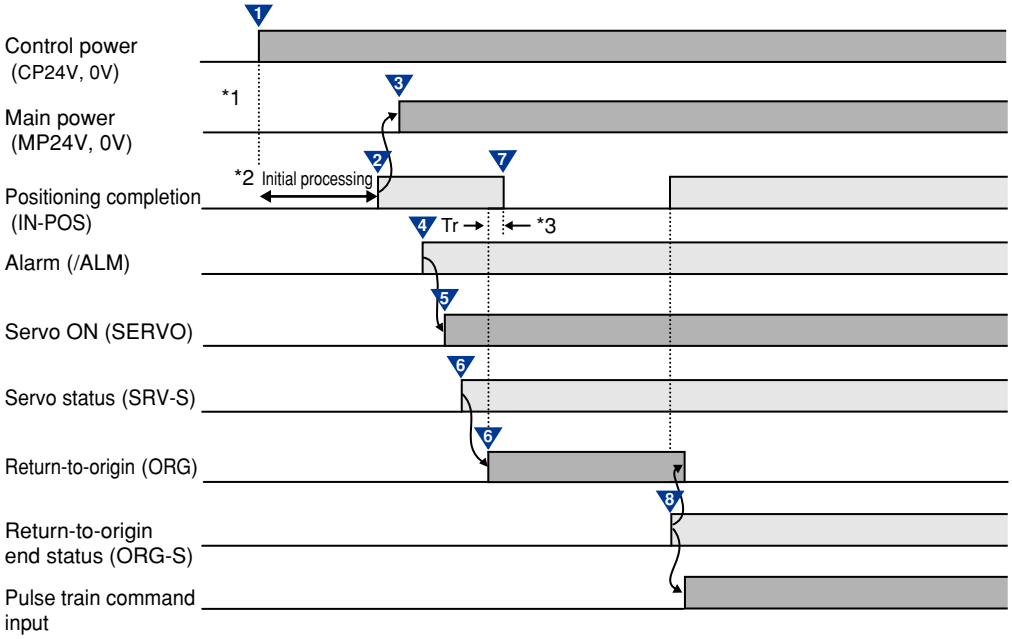
Contents

1. Operation procedure

1.1 Overall operation timing chart

The following shows the operation timing chart from "power ON" to "operation by pulse train command input".

"Power ON" to "operation by pulse train command input"



23501-M4-00

1: Turn the control power ON.
2: After the initial processing is completed, the IN-POS signal switches ON.
3: The safety circuit and main circuit switch ON.
4: The /ALM signal switches ON.
5: Turn the SERVO input ON.
6: After the SRV-S signal switches ON, the ORG input switches ON.
7: When the return-to-origin starts, the IN-POS signal switches OFF.
8: When the ORG-S signal switches ON, the ORG input switches OFF and the operation starts according to the command input.

*1: For details about how to configure a safety circuit related to the emergency stop and main power supply, see section 7, "Configuring an emergency stop circuit" in Chapter 2.
*2: After the control power has been turned ON, the internal system will be initialized. It takes approx. 1 sec. to initialize the internal system. After the initial processing has been completed, the IN-POS output switches ON.
*3: A delay of 5 ms or longer needs to be provided until the positioning completion (IN-POS) signal OFF is checked after the return-to-origin (ORG) has been input.

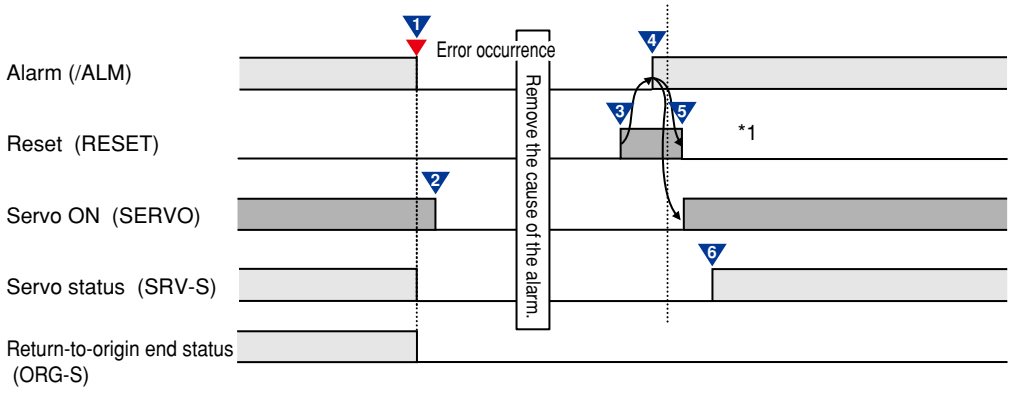
CAUTION

- **Do not turn ON the return-to-origin (ORG) input while the pulse train command is input. Otherwise, the return-to-origin may not be completed correctly.**
- **Do not turn ON the servo ON (SERVO) input while the pulse train command is input. Otherwise, the robot may start operating suddenly.**
- **Do not input the pulse train command during return-to-origin operation. Otherwise, a positional deviation may occur.**
- **If the return-to-origin (ORG) signal is turned OFF during return-to-origin operation, the return-to-origin operation is cancelled and it is not completed correctly. The return-to-origin (ORG) signal must be kept turned ON until the return-to-origin is completed successfully. To verify whether or not the return-to-origin has been completed successfully, check the return-to-origin end status (ORG-S) signal.**

1.2 Alarm occurrence and clearing

The following explains the timing chart from "alarm occurrence" to "alarm clear".

"alarm occurrence" to "alarm clear"



23502-M4-00

1: /ALM switches OFF if an error occurs during operation. At the same time, ORG-S and SRV-S switch OFF.

2: The SERVO input switches OFF.

3: The RESET input switches ON after the alarm cause has been eliminated.

4: /ALM switches ON.

5: The RESET input switches OFF, and the SERVO input switches ON.

6: SRV-S switches ON and the return-to-origin is ready to start.

*1: The reset signal is valid after the cause of the alarm has been removed. Additionally, the alarm is reset by removing the cause or it may be required to turn off the power, and then turn it on again depending on the cause. For details, see Chapter 6, "Troubleshooting".

2. Origin search (return-to-origin)

To decide the absolute position in the P1, it is absolutely required to determine the origin point. This operation is called "origin search (return-to-origin)". As the origin search (return-to-origin) is performed, the absolute coordinates of the robot are determined.
A dedicated "origin search" ("return-to-origin") input is provided on the P1. After the torque has been detected by means of the stroke-end method, the robot always stops at the same position.

WARNING

BEFORE STARTING THE RETURN-TO-ORIGIN OPERATION, MAKE SURE THAT THE ROBOT OPERATION BY THE PULSE TRAIN COMMAND INPUT FROM THE HOST UNIT IS NOT RUNNING. IF THE RETURN-TO-ORIGIN OPERATION IS STARTED WHILE THE ROBOT IS MOVING BY THE PULSE TRAIN COMMAND INPUT, THE RETURN-TO-ORIGIN OPERATION MAY NOT BE COMPLETED CORRECTLY.

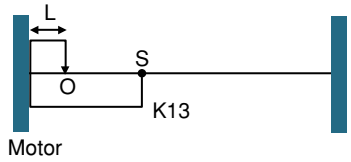
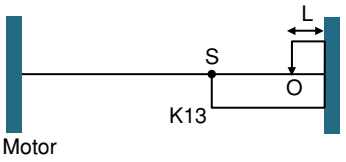
CAUTION

- **If the ORG signal is turned OFF during the return-to-origin operation, the return-to-origin operation is cancelled and it is not completed correctly. The ORG signal must be kept turned ON until the return-to-origin is completed successfully. To verify whether or not the return-to-origin has been completed successfully, check the return-to-origin end status (ORG-S) signal.**
- **The robot can be operated even when the return-to-origin is not performed. In this case, however, the P1 cannot recognize the absolute position of the robot. If the return-to-origin function is not used, install external sensors to configure an appropriate process so that the host unit monitors the robot position.**

2.1 Origin point detection method

The origin point detection method of the P1 is the stroke-end method.
As the return-to-origin starts, the robot moves in a specified return-to-origin direction until it is in contact with the mechanical end. At this time, the movement direction is reversed by the motor torque detection and the robot returns by an amount which is unique to each robot. The robot movement then stops and the return-to-origin end status is established.

Stroke-end (torque detection) method

Model	Return-to-origin direction (K14) = 0 (CCW)	Return-to-origin direction (K14) = 1 (CW)
P1		

S: (Return-to-origin start position); 0: (Origin point); K13: Return-to-origin speed

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CAUTION

The appropriate return-to-origin method is factory-set for each robot according to its type. So, do not change it.

2.2 Machine reference

This machine reference a numeric value that shows the difference between the position where the reference origin signal is detected and the reference position of the position sensor of the motor when the origin search (return-to-origin) is performed. The machine reference is factory-adjusted to within 25% to 75%. (The adjustment range varies according to the robot type. For details, refer to the user's manual for the robot being used.) The machine reference can be checked when the return-to-origin is executed from the support software (RS-Manager).

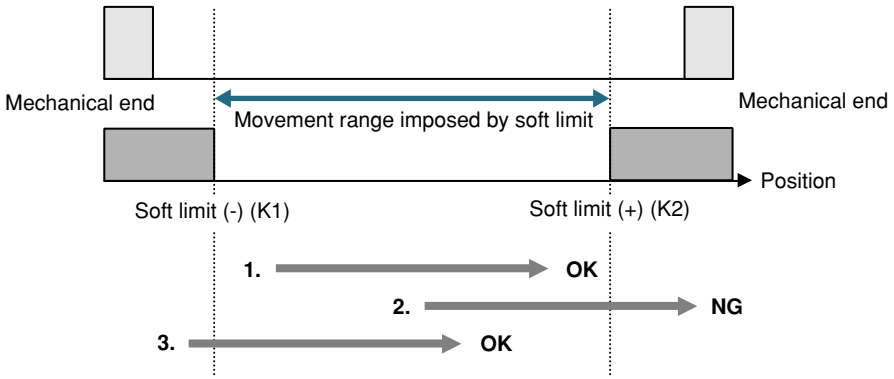
NOTE

The machine reference must be readjusted if it is not within the 25 to 75% range (or if it is outside the allowable range of the robot being used). For details on the adjustment procedure, please contact us.

3. Soft limit function (only for JOG operation from RS-Manager)

Software imposed limits can be applied to the robot's range of motion in order to prevent interference with peripheral equipment. Robot movement is then restricted to target positions which are within the range specified by the soft limit function. The soft limit range can be set at the K1 (soft limit (-)) and K2 (soft limit (+)) RUN parameters.
This function is valid only when the JOG movement is executed from the support software (RS-Manager).

Soft limit function



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1: Movement from a stop position within the soft limit to a target position within the soft limit → OK (permitted).
2: Movement from a stop position within the soft limit to a target position outside the soft limit → NG (prohibited).
3: Movement from a stop position outside the soft limit to a target position within the soft limit → OK (permitted).

CAUTION

This function is valid only when the JOG movement is executed from the support software.
Preventive measures shown below must be taken so that the robot does not overrun its stroke during normal operation

- **Do not send the pulse train command input exceeding the effective stroke.**
- **Install an external limit switch for detection of the stroke end to forcibly stop the robot movement.**

4. LED status indicators

Operation statuses are indicated by two types of LEDs located on the front panel of the P1.
The following table shows the LED statuses and their meanings.

LED Name	Color	Status	Meaning
PWR	Blue	OFF	Control power shutoff
		Blinking (at 0.5sec intervals)	Servo OFF
		ON (constant ON)	Servo ON
ERR	Red	OFF	Control power shutoff or no active error alarms (normal)
		Blinking (at 0.5sec intervals)	Error alarm active (external cause)
		ON (constant ON)	Error alarm active (internal cause)

Chapter 6 Troubleshooting

Contents

1. Alarm groups

The alarms of the P1 are mainly classified into five groups as described below.

Group	Description
Message alarm	Error messages involving data editing or operation commands sent as data.
Operation alarm	Alarm that appears when operation ends due to an error.
Error alarm (internal cause)	Alarm that occurs due to internal causes. To reset the alarm, reset the alarm or turn off the power, and then turn it on again after the cause of the alarm has been removed. An alarm description is stored in the alarm history.
Error alarm (external cause)	Alarm that occurs due to external causes. Alarm occurs when safety circuit is triggered. Operation can resume after eliminating the cause.
Warning alarm	Alarm that shows only a warning. This alarm does not directly affect the operation.

2. Alarm recording function

This function records and stores only the error alarms (internal cause) as they occur, along with their alarm numbers and various conditions at that time. Up to 50 alarms can be stored.

* This function does not store the "81: AC POWER DOWN" error alarm.

■ Alarm description

Item	Description	Units
Cause	If 2 or more error alarms occur, the cause of the alarm with the smaller alarm No. is stored.	-
Time	Total time counted while control power was on.	Day : hour : minute
Position	Current position information when an alarm occurred.	mm
Speed	Speed at which robot was moving when alarm occurred.	mm/s
Current	Command current when alarm occurred.	%
Voltage	Motor power voltage when alarm occurred.	V
Input	Input information when alarm occurred.	-
Output	Output information when alarm occurred.	-

3. Alarm list

The following table shows alarm numbers, messages, and reset methods.

Alarm No.	Alarm Message	Reset *1
02	DATA ERROR	-
03	DATA RANGE OVER	-
05	RUNNING	-
41	SERVO OFF	-
42	ORIGIN INCOMPLETE	-
44	SOFTLIMIT OVER	-
46	STOP KEY	-
48	ORG. MISTAKE	-
49	SERIAL COMM. ERR.	-
4A	PULSE INPUT MODE	-
81	AC POWER DOWN	Restart
82	ENCODER ERROR	Restart
85	OVERHEAT	Reset
86	OVERLOAD	Reset
87	OVERVOLTAGE	Reset
88	LOW VOLTAGE	Reset
89	POSITION ERROR	Reset
8E	OVERCURRENT	Reset
8F	MOTOR CURRENT ERR.	Reset
92	CPU ERROR	Reset
94	MOTOR LINE DISCONNECTION	Reset
95	OVER SPEED	Reset
96	OVER PULSE FREQUENCY	Reset
C1	EMERGENCY STOP	Eliminate cause
C2	MOTOR POWER DOWN	Eliminate cause

4. Alarms: Possible causes and actions

Message alarms

No.	Message	Meaning	Possible Cause	Action
02	DATA ERROR	Data setting error	Attempt was made to enter data that exceeded the specified range.	Enter data within the specified range.
03	DATA RANGE OVER	Data setting range exceeded.	Written data exceeded the specified range.	Write data within the specified range.
05	RUNNING	Operation command was executed during operation.	Another operation was attempted during operation.	Stop the operation and then re-execute the command.

Operation alarms

No.	Message	Meaning	Possible Cause	Action
41	SERVO OFF	Servo is off.	Operation was attempted while the servo was off. Servo turned off during operation.	Turn the servo on.
42	ORIGIN INCOMPLETE	Origin search (return-to-origin) is incomplete.	Servo was OFF after completion of the origin search.	Perform an origin search.
			"Origin search direction" (K14) or "Axis polarity" (K15) was changed.	
			Parameter was transferred from PC.	
44	SOFTLIMIT OVER	Software limit was exceeded.	Positioning operation was attempted to move to a point exceeding the soft limits.	Adjust the target position so that it is within the soft limits.
46	STOP KEY	Operation stop was input.	Stop command was input during operation using PC.	Restart the operation.
48	ORG. MISTAKE	Failed to detect origin at return-to-origin	5 minutes or more elapsed after return-to-origin occurred.	Correct the environment related to the return-to-origin operation.
49	SERIAL COMM. ERR.	Serial communication error occurred between P1 and communication device.	Communication cable is defective.	Replace the communication cable.
			Communication device failed.	Replace the communication device.
4A	PULSE INPUT MODE	Communication command was received in pulse input mode.	P1 received the JOG operation, inching operation or origin search command through RS-232C in status that pulse train input type was not set disabled.	To use the communication commands, set "0" for the option parameter "Pulse train input type" (K83). JOG operation, inching operation, or origin search command sent from RS-Manager can be used only when the pulse train input type is set disabled.

■ Error alarms (internal causes)

No.	Message	Meaning	Possible Cause	Action
81	AC POWER DOWN	Drop in control power supply voltage.	Power supply voltage too low.	Check the power supply.
			Power supply does not have sufficient capacity.	
			P1 failed.	Replace the P1.
82	ENCODER ERROR	Error occurred during data exchange with position detector.	Robot I/O cable is not securely connected.	Connect the robot I/O cable correctly.
			Robot I/O cable failed.	Replace the robot I/O cable.
			Wrong combination of P1 and robot.	Make a correct combination of the P1 and robot.
			Position detector failed.	Replace the motor.
			Position detection circuit failed.	Replace the P1.
85	OVERHEAT	Temperature protection level (90˚C) was exceeded.	Ambient temperature is above 40˚C.	Check the ambient condition.
			Thermal sensor failed.	Replace the P1.
86	OVERLOAD	Overload detection level was exceeded.	Rated current was exceeded.	Reduce the load. Set the payload correctly. Lower the duty cycle.
			Robot drive system collided with some objects.	Check the operation pattern.
			Electromagnetic brake is not working.	Replace the robot cable.
				Replace the brake.
			Wrong robot setting	Make correct robot setting.
87	OVERVOLTAGE	Overvoltage protection level (35V) was exceeded.	Main power supply voltage exceeded the specified range.	Check the power supply.
				Replace the connection cable.
88	LOW VOLTAGE	Power supply voltage dropped below the low voltage detection level (15V).	Main power supply voltage does not reach the specified value.	Check the power supply.
			P1 failed.	Replace the P1.
89	POSITION ERROR	Position deviation overflow level was exceeded.	Robot drive unit collided with some objects.	Check the operation pattern.
			Motor cable was disconnected.	Connect the motor cable correctly.
			Wrong robot setting	Make correct robot setting.
8E	OVERCURRENT	Current higher than the allowable current flow was detected.	Robot drive unit collided with some objects.	Check the operation pattern.
			Motor cable was short-circuited.	Replace the motor cable.
			Motor failed.	Replace the motor.
8F	MOTOR CURRENT ERR.	Motor current does not follow up on command.	Motor cable is disconnected.	Connect the motor cable correctly.
			Motor cable broke or failed.	Replace the motor cable.
			Motor failed.	Replace the motor.
			Wrong robot setting	Make correct robot setting.
92	CPU ERROR	CPU stopped due to error.	CPU failed.	Cancel the alarm. If the alarm occurs again, replace the P1.
94	MOTOR LINE DISCONNECTION	Motor line disconnection was detected during servo ON.	Motor cable is not securely connected.	Connect the motor cable correctly.
			Motor cable broke or failed.	Replace the motor cable.
			Motor failed.	Replace the motor.
			P1 failed.	Replace the P1.

No.	Message	Meaning	Possible Cause	Action
95	OVER SPEED	Robot command speed exceeded 110% of the max. speed. *1	Wrong robot setting	Make correct robot setting.
			Command speed was excessive.	Decrease the speed. * For details about max. speed of each model, see the user's manual for robot.
			P1 failed.	Replace the P1.
96	OVER PULSE FREQUENCY	Pulse train command input frequency greatly exceeded the frequency of the specifications.	Pulse train command input frequency was excessive.	Decrease the pulse train command input frequency.
			Wrong pulse train mode setting	Set the pulse train mode correctly.
			Malfunction due to noise	Review the ambient environment.
				Review the noise prevention measures for the I/O cable.

*1 The max. speed of the robot you are using can be checked while referring to section 3, "Reference graphs and tables of speed and acceleration settings using payload and stroke" in Chapter 4 or through the support software (RS-Manager).

■ Error alarms (external causes)

No.	Message	Meaning	Possible Cause	Action
C1	EMERGENCY STOP	Emergency stop was activated.	External safety circuit functioned and emergency stop was activated.	Ensure safety and then cancel the safety circuit.
			Emergency stop wiring is incomplete. Wiring is wrong.	Configure the safety circuit correctly.
C2	MOTOR POWER DOWN	Drop in main power supply voltage.	External safety circuit functioned and main power supply turned off.	Ensure safety and then cancel the safety circuit.
			Main power was not supplied.	Supply the main power correctly.

Trouble	Probable cause 1	Probable cause 2	Action
Robot did not move even when the command pulses were input.	Hardware connection was incorrect.	Wiring was incorrect.	Correct the wiring.
	Software setting was incorrect	E-Gear setting was different from the assumed level.	Check the settings of the parameters K84 and K85.
		Phase A/Phase B input was incorrectly set for the CW/CCW input specifications.	Set "1" for the parameter K83.
		Phase A/Phase B input was incorrectly set for the Pulse/Sign input specifications.	Set "2" for the parameter K83.
		CW/CCW input was incorrectly set for the Phase A/Phase B input specifications.	Set "3" for the parameter K83.
		Parameter K83 was set invalid.	Set the parameter K83 correctly.
		Command pulses with a frequency exceeding the operable range were input.	Input the frequency within the specification range.
	Driver failed.		Replace the driver.
Movement distance was short when compared to the input command pulses.	Hardware connection was incorrect.	Wiring was incorrect.	Correct the wiring.
	Software setting was incorrect	E-Gear setting was different from the assumed level.	Check the settings of the parameters K84 and K85.
		Pulse/Sign input was incorrectly set for the Phase A/Phase B input specifications.	Set "3" for the parameter K83.
		LD input was incorrectly set for the OC input specifications.	
		OC input was incorrectly set for the LD input specifications.	
		Command pulses with a frequency exceeding the operable range were input.	Input the frequency within the specification range.
	Driver failed.		Replace the driver.
Movement distance was long when compared to the input command pulses. (Or, the robot moved spontaneously.)	Hardware connection was incorrect.	Wiring was incorrect.	Correct the wiring.
	Software setting was incorrect	LD input was incorrectly set for the OC input specifications.	Change the setting of the parameter K87 to the OC input.
		E-Gear setting was different from the assumed level.	Check the settings of the parameters K84 and K85.
	Driver failed.		Replace the driver.
Robot moved in a direction opposite to the input command pulse.	Hardware connection was incorrect.	Wiring was incorrect.	Correct the wiring.
	Software setting was incorrect	Pulse/Sign input was incorrectly set for the CW/CCW input specifications.	Set "1" for the parameter K83.
		CW/CCW input was incorrectly set for the Pulse/Sign input specifications.	Set "2" for the parameter K83.
		Pulse/Sign input was incorrectly set for the Phase A/Phase B input specifications.	Set "3" for the parameter K83.
	Driver failed.		Replace the driver.
Robot moved only in one direction.	Hardware connection was incorrect.	Wiring was incorrect.	Correct the wiring.
	Software setting was incorrect	Pulse/Sign input was incorrectly set for the CW/CCW input specifications.	Set "1" for the parameter K83.
		CW/CCW input was incorrectly set for the Pulse/Sign input specifications.	Set "2" for the parameter K83.
	Driver failed.		Replace the driver.

Chapter 7 Specifications

Contents

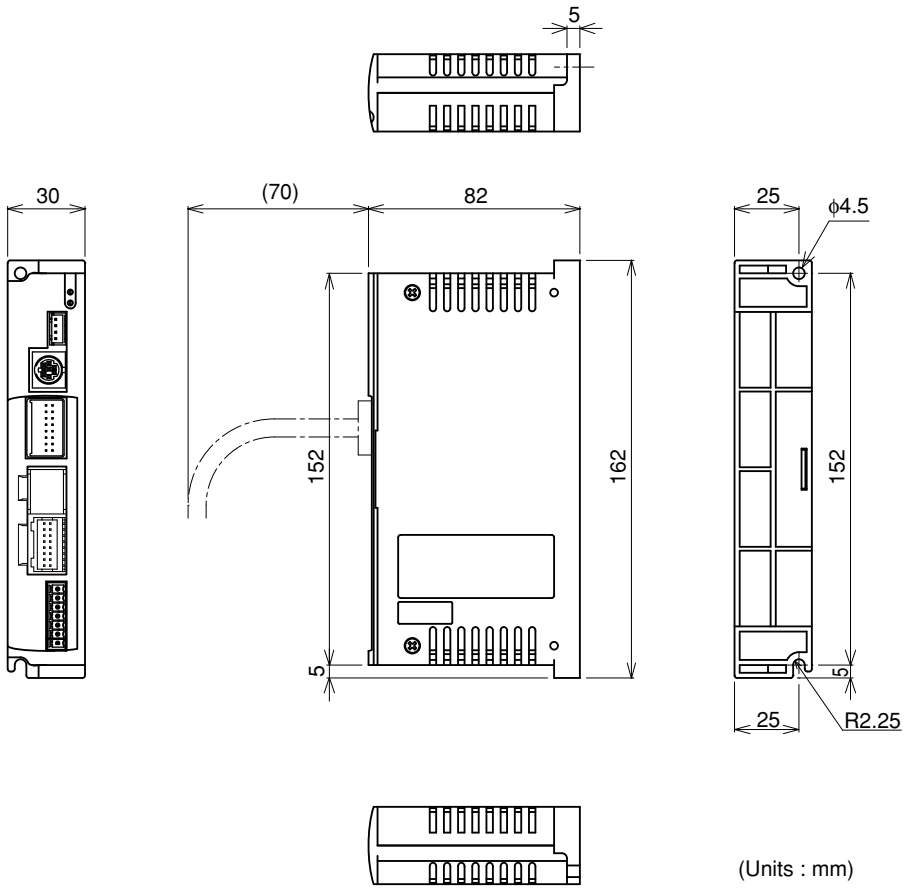
1. P1 specifications

1.1 Basic specifications

Item	P1
Controllable robot	RS1/RS2/RS3 RS1C/RS2C/RS3C RSD1/RSD2/RSD3 RSDG1/RSDG2/RSDG3
Current consumption	2.5A (Max. 4.5A)
Dimensions	W30×H162×D82mm
Weight	Approx. 0.2kg
Control power supply	24V DC ±10%
Main power supply	24V DC ±10%
Control method	Closed loop vector control method
Position detection method	Resolver (resolution: 20480 P/r)
Pulse train command input	Line driver method : 500 kpps or less Open collector method : 100 kpps or less (DC5 to 24V ± 10%)
Input	Servo ON (SERVO), reset (RESET) origin search (ORG)
Output	Servo status (SRV-S), alarm (/ALM), positioning completion (IN-POS), return-to-origin end status (ORG-S)
Communication	RS-232C, 1 channel
Protection function	Position detection error, overheat, overload, overvoltage, low voltage, position deviation, overcurrent, motor current error, motor line disconnection, command speed over, pulse frequency over
Ambient operating temperature and humidity	0 to 40˚C, 35 to 85% RH (no condensation)
Storage ambient temperature and humidity	-10 to 65˚C, 10 to 85% RH (no condensation)
Atmosphere	Indoor, not exposed to direct sunlight. No corrosive gas, inflammable gas, oil mist, and dust particles should be present.
Vibration resistance	10 to 57Hz in each of XYZ directions, single amplitude 0.075mm, 57 to 150Hz, 9.8m/s^2

1.2 Dimensional outlines

Dimensional outlines



(Units : mm)

21701-M4-00

Revision record

Manual version	Issue date	Description
Ver. 1.00	Mar. 2014	First edition
Ver. 2.00	Jan. 2018	Added the contents of "Warranty", Deleted IO cable from packing of "Unpacking check", Corrected the contents of "Communication unit connection", Corrected the initial value of positioning completion width in "2.1.1 RUN parameters", Corrected the content of positioning completion width in "2.2.1 RUN parameters", Corrected the contents of "P1 specifications", etc.
Ver. 2.01	Dec. 2020	Corrected the contents of "Safety Standards" to EMC Directive 2014/30/EU

User's Manual

PULSE TRAIN DRIVER

P1

Dec. 2020
Ver. 2.01
This manual is based on Ver. 2.01 of Japanese manual.

MISUMI Corporation

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