MITSUBISHI Mitsubishi Industrial Robot

RH-6SDH/12SDH/18SDH/20SDH Series RH-3SDHR series

Standard Specifications Manual (CR1DA/CR2DA/CR3D-700 series Controller)





🛕 Safety Precautions

Always read the following precautions and the separate "Safety Manual" before starting use of the robot to learn the required measures to be taken.

♠ CAUTION

All teaching work must be carried out by an operator who has received special training. (This also applies to maintenance work with the power source turned ON.)

Enforcement of safety training

CAUTION

For teaching work, prepare a work plan related to the methods and procedures of operating the robot, and to the measures to be taken when an error occurs or when restarting. Carry out work following this plan. (This also applies to maintenance work with the power source turned ON.)

Preparation of work plan

⚠ WARNING

Prepare a device that allows operation to be stopped immediately during teaching work. (This also applies to maintenance work with the power source turned ON.)

Setting of emergency stop switch

⚠ CAUTION

During teaching work, place a sign indicating that teaching work is in progress on the start switch, etc. (This also applies to maintenance work with the power source turned ON.)

Indication of teaching work in progress

∕N WARNING

Provide a fence or enclosure during operation to prevent contact of the operator and robot.

Installation of safety fence

⚠ CAUTION

Establish a set signaling method to the related operators for starting work, and follow this method.

Signaling of operation start

⚠ CAUTION

As a principle turn the power OFF during maintenance work. Place a sign indicating that maintenance work is in progress on the start switch, etc. Indication of maintenance work in progress

⚠ CAUTION

Before starting work, inspect the robot, emergency stop switch and other related devices, etc., and confirm that there are no errors. Inspection before starting work

The points of the precautions given in the separate "Safety Manual" are given below. Refer to the actual "Safety Manual" for details.

⚠ CAUTION	Use the robot within the environment given in the specifications. Failure to do
	so could lead to a drop or reliability or faults. (Temperature, humidity,
	atmosphere, noise environment, etc.)

Transport the robot with the designated transportation posture. Transporting the robot in a non-designated posture could lead to personal injuries or faults from dropping.

CAUTION Always use the robot installed on a secure table. Use in an instable posture could lead to positional deviation and vibration.

CAUTION Wire the cable as far away from noise sources as possible. If placed near a noise source, positional deviation or malfunction could occur.

CAUTION

Do not apply excessive force on the connector or excessively bend the cable.

Failure to observe this could lead to contact defects or wire breakage.

Make sure that the workpiece weight, including the hand, does not exceed the rated load or tolerable torque. Exceeding these values could lead to alarms or faults.

Securely install the hand and tool, and securely grasp the workpiece. Failure to observe this could lead to personal injuries or damage if the object comes off or flies off during operation.

MARNING

Securely ground the robot and controller. Failure to observe this could lead to malfunctioning by noise or to electric shock accidents.

Indicate the operation state during robot operation. Failure to indicate the state could lead to operators approaching the robot or to incorrect operation.

WHEN CARRYING When carrying out teaching work in the robot's movement range, always secure the priority right for the robot control. Failure to observe this could lead to personal injuries or damage if the robot is started with external commands.

CAUTION Keep the jog speed as low as possible, and always watch the robot. Failure to do so could lead to interference with the workpiece or peripheral devices.

After editing the program, always confirm the operation with step operation before starting automatic operation. Failure to do so could lead to interference with peripheral devices because of programming mistakes, etc.

Make sure that if the safety fence entrance door is opened during automatic operation, the door is locked or that the robot will automatically stop. Failure to do so could lead to personal injuries.

CAUTION

Never carry out modifications based on personal judgments, or use non-designated maintenance parts.

Failure to observe this could lead to faults or failures.

∕∖\ WARNING

When the robot arm has to be moved by hand from an external area, do not

when the robot arm has to be moved by hand from an external area, do not place hands or fingers in the openings. Failure to observe this could lead to hands or fingers catching depending on the posture.

A CAUTION

Do not stop the robot or apply emergency stop by turning the robot controller's main power OFF. If the robot controller main power is turned OFF during automatic operation, the robot accuracy could be adversely affected. Moreover, it may interfere with the peripheral device by drop or move by inertia of the arm.

A CAUTION

Do not turn off the main power to the robot controller while rewriting the internal information of the robot controller such as the program or parameters. If the main power to the robot controller is turned off while in automatic operation or rewriting the program or parameters, the internal information of the robot controller may be damaged.

A CAUTION

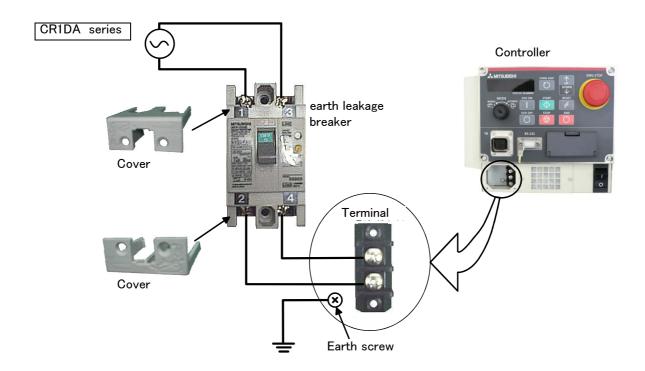
Use the network equipments (personal computer, USB hub, LAN hub, etc) confirmed by manufacturer. The thing unsuitable for the FA environment (related with conformity, temperature or noise) exists in the equipments connected to USB, RS-232 or LAN. When using network equipment, measures against the noise, such as measures against EMI and the addition of the ferrite core, may be necessary. Please fully confirm the operation by customer. Guarantee and maintenance of the equipment on the market (usual office automation equipment) cannot be performed.

C.Notes of the basic component are shown.

*SD series: CR1DA-700 series

A CAUTION

Please install the earth leakage breaker in the primary side supply power supply of the controller because of leakage protection.





Be careful of interference with peripheral equipment. Especially don't give a shock to the ball screw shaft (J3 axis). The ball screw shaft may be damaged.

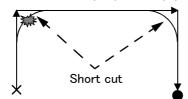
Collision detection function is valid condition for both of automatic and jog operation at shipping in RH-3SDHR series. However, damage to the ball screw shaft cannot be prevented completely.

Refer to the separate instruction manual "Detailed explanations of functions and operations" for collision detection function.

Take care also of the following items.

(1)The robot's locus of movement may change with specified speed.

Especially as for the corner section, short cut distance may change. Therefore, when beginning automatic operation, moves at low speed at first, and you should gather speed slowly with being careful of interference with peripheral equipment.



Arch movement (example)

(2)It can be confirmed whether the specified position exist in the defined area by using the instruction command "ZONE". It can utilize as one of the methods for collision evasion. Refer to the "detailed description of the instructions manual/function, and operation" of the separate volume for the details of the instruction command.



Don't give a shock to the ball screw shaft at the time of hand installation. Especially don't strike the shaft end by hammer etc. The ball screw shaft may be damaged.

■ Revision history

Date of print	Specifications No.	Details of revisions			
2008-06-30	BFP-A8658	• First print.			
2008-11-10	BFP-A8658-A	The example of filter installation to the servo amplifier for addition axes was added. CE Marking specification was added.			
2008-12-18	BFP-A8658-B	· Difference of connector assignment of of sink and source type of parallel I/O interface/unit were added.			
2009-02-10	BFP-A8658-C	· EC Declaration of Conformity were added.			
2009-03-09	BFP-A8658-D	 Correct description of the "S" number in the robot type. Add the type of the caster specification controller. flange was changed into mechanical interface The description of the fretting was corrected. The example of emergency stop connection of the example of safety measures was improved. Functional description of the enabling device was improved. 			
2009-04-22	BFP-A8658-E	The following expressions were corrected 1.1.2 Special specifications, 1.1.3 Options, 1.1.4 Maintenance parts, 1.2 Model type name of robot, 1.5 Instruction manuals, 1.6.1 Robot arm, Extended machine cable(Table 1-3), Hand output cable(Table 1-3), Hand input cable(Table 1-3), CC-Link interface(Table 1-3), Controller specification with countermeasure against oil mist(Table 1-3), Recommendation article of the USB cable, 2.2.5 Protection specifications, (1)Machine cable(special specifications and option), Table 3-1 Standard specifications of controller, The operation lock of the power switch, The following errors in writing were corrected, Stopper for changing the operating range of the J1 axis(Table 1-3), Caster specifications controller(Table 1-3), The following was added Serial encoder interface(Table 3-1),			
2009-07-17	BFP-A8658-F	Additional Axis Function and Tracking Function Manual were added to the product configuration of Instruction Manual. The English expression was corrected. Safety Precautions, 1.1.2 Special specifications, Table 1.3: The list of Option equipment and special specification, Caution of USB devices, 2.6.1 Shipping special specifications 6.1.7 Examples of safety measures Parameter AREA*CS was added.			
2009-09-10	BFP-A8658-G	The examples of safety measures (Wiring example 3 \sim 5) were corrected.			
2009-10-26	BFP-A8658-H	 The figure of key switch in "3.6.3 Door switch function " was corrected. (Error in writing The figure of example of safety measures in "6.1.7 Examples of safety measures" was corrected. (connects the enabling switch) The EC Declaration of Conformity was changed. (Correspond to the EMC directive; 2006/42/EC) 			
2009-12-04	BFP-A8658-J	 Fuse rating of pneumatic hand interface (RZ365/375) was corrected. The text of "This interface is pre-installed on the controller" in pneumatic hand interface was deleted. 			
2010-05-06	BFP-A8658-K	 The example of connection with the Mitsubishi sequencer of Parallel I/O unit was changed into Q series. Pressure of the dry air for pressurization was corrected. The type which lengthened the J3 axis (Z) stroke was added. RH-6SDQH3532/4532/5532, RH-6SDQH3527C/4527C/5527C, RH-6SDQH3527M/4527M/5527M RH-12SDQH5545/7045/8545, RH-12SDQH5538C/7038C/8538C, RH-12SDQH5538M/7038M/8538M 			
2010-06-08	BFP-A8658-L	CE specification of the CR1DA controller was added. Frror in writing was corrected			
2010-06-17	BFP-A8658-M	 Explanation of the new RH-20SDH series was added. The type name of robot controller was changed with specification change.(CR1D to CR1DA, CR2D to CR2DA) 			
2010-07-27	BFP-A8658-N	Cover packing was added to the consumable part. The description of protection specification was changed. (The cutting oil which examined was updated, and replacement of the cover packing was added) EC Declaration of Conformity were added.			
2010-08-25	BFP-A8658-P	• The input voltage range of the CR2DA controller was corrected. ("3-phase, AC180 to 253" was the previous.)			
2010-11-19	BFP-A8658-Q	 The RH-3SDHR3515 was added. The dimensions of the hole which draws the power cable were added (CR2DA controller). The type name optional of hand input cable and hand curl tube for RH-20SDH100** series was changed. The EC Declaration of Conformity were added. 			

Date of print Specifications No.		pecifications No. Details of revisions		
2010-11-30	BFP-A8658-R	The EC Declaration of Conformity were added.		
2010-12-02	BFP-A8658-S	 The coupling for air purge in figure of "Wiring and piping for hand (RH-3SDHR)" was deleted. (error in writing). The type name of optional hand input cable for RH-3SDHR was changed. 		
2010-12-21	BFP-A8658-T	 The sink / source expression of pin assignment of hand input cable was corrected. (Sink / Source are common) The type name of optional hand curl tube for RH-20SDH100** series was changed. The hand curl tube outline drawing was corrected. (Error in writing) 		
2011-02-02	BFP-A8658-U	 The outside dimension of CR1DA controller (CE marking specification) was changed. The rear cover of the CR1DA controller was made unnecessary. Ball screw protective measures were added. The note about temperature of the air to supply for hand was added. Part code was added to the consumable part. 		
2011-05-09	BFP-A8658-V	Hand output junction cable was added to the solenoid valve set optional. (RH-6SDH/12SDH/18SDH/20SDH series) Table 1-5: Recommendation article of the USB cable was corrected.		
2011-06-01	BFP-A8658-W	 The user's guide was added based on South Korean Radio Law. Fuse rating of pneumatic hand interface (RZ365/375) was corrected. (error in writing). The setting value range of parameter SFC*ME and AREA*ME were corrected. (error in writing). 		
2011-07-01	BFP-A8658-X	The note about the connection of the emergency stop was added. The automatic compensation graph of the RH-6SDH's Z-stroke-200mm in "Automatic compensation of acceleration/deceleration speed" was corrected. (Clarified. With no change in acceleration/deceleration speed rate) The signal assignment list of parallel I/O interface and parallel I/O unit were corrected. (Assignment of the dedicated signal was added)		
2012-01-26	BFP-A8658-Y	The EC Declaration of Conformity were changed.		
2012-05-22	BFP-A8658-AA	 The target axis and interval of intermittent brake release were added. QJ61BT11N (Q series) was added to the master station of the CC-Link interface. The "Emergency stop output" in the controller standard specification table was deleted (Overlapped with "Robot error output".) The "Table 3-3: Emergency stop/Door switch input" in "3.4 External input/output" was deleted. (Overlapped with "Table 3-5: Special input/output terminal".) Error in writing in table of Standard specifications of robot was corrected. (allowable moment load -> allowable inertia) The details of hand output junction cable were added. Clean specification and waterproof (IP65) specification were added for RH-3SDHR serie The EC Declaration of Conformity were changed. RH-20SDH100* was added to "2.4.7 Changing the operating range" Correction of an error in "2.5.7 About the Installation of Tooling Wiring and Piping". (formerly: Floor installation type) 		
2012-07-11	BFP-A8658-AB	 The note about the connection of the emergency stop was added. The EC Declaration of Conformity were changed. The notes about frequent installation and removal of TB and the dummy connector were added. The explanation about the controller of KC mark specification was added to " ■ Introduction". 		

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■ Introduction

The RH-6SDH/12SDH/18SDH/20SDH series, RH-3SDHR series offers small-size industrial robots developed using Mitsubishi's latest technology. They are especially designed to handle and assemble mechanical parts. They are Mitsubishi's answer to the customer's need to achieve a compact manufacturing facility capable of highly flexible production, as necessitated by the diffusion of high-density product groups and the shorter product life cycles that have become common-place in recent years. About RH-3SDHR series, because the installation surface does not give limitation to the operating range, it can work to the layout in the customer flexibly.

However, to comply with the target application, a work system having a well-balanced robot arm, peripheral devices or robot and hand section must be structured.

When creating these standard specifications, we have edited them so that the Mitsubishi robot's characteristics and specifications can be easily understood by users considering the implementation of robots. However, if there are any unclear points, please contact your nearest Mitsubishi branch or dealer. Mitsubishi hopes that you will consider these standard specifications and use our robots.

The controller differ corresponding to the specification of robot. Please refer to Page 2, "1.2 Model type name of robot" or Page 4, "1.3 CE marking specifications".

Note that in this specification document the specifications related to the robot arm is described Page 10, "2 Robot arm", the specifications related to the controller Page 119, "3 Controller", and software functions and a command list Page 206, "4 Software" separately.

This document has indicated the specification of the following types robot.

On floor type.....*RH-6SDH series

*RH-12SDH series

*RH-18SDH series

*RH-20SDH series

Hanging typeRH-3SDHR series

About KC mark specifications

This robot acquires certification of KC mark by the special specification (S19).

Although about CR1DA controller the two kinds of controllers (standard specification / CE Marking specification) are described in this book and you can choose either one, The external form of controller which have KC mark specification is same as the controller which described as "CE Marking specification". Refer to the place described as "CE Marking specification" about the external form of KC mark specification's

Refer to the place described as CE Marking specification about the external form of KC mark specification's controller. (However, the parallel I/O interface (2D-TZ378) is not installed at shipping)

Especially the places with no distinction are common specifications.

And, it is the same as that of the CE Marking specification in the same manner about CR2DA and CR3D controller.

- No part of this manual may be reproduced by any means or in any form, without prior consent from Mitsubishi.
- The contents of this manual are subject to change without notice.
- The specifications values are based on Mitsubishi standard testing methods.
- The information contained in this document has been written to be accurate as much as possible. Please interpret that items not described in this document "cannot be performed." or "alarm may occur".
 - Please contact your nearest dealer if you find any doubtful, wrong or skipped point.
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1 General configuration

1.1 Structural equipment

Structural equipment consists of the following types.

1.1.1 Standard structural equipment

The following items are enclosed as a standard.

- (1) Robot arm
- (2) Controller
- (3) Machine cable
- (4) Robot arm installation bolts
- (5) Earth leakage breaker (CR1DA-700 series only)
- (6) Safety manual, Instruction manual, CD-ROM (Instruction manual)
- (7) Guarantee card

1.1.2 Special specifications

For the special specifications, some standard configuration equipments and specifications have to be changed before factory shipping. Confirm the delivery date and specify the special specifications at the order.

1.1.3 Options

User can install options after their delivery.

1.1.4 Maintenance parts

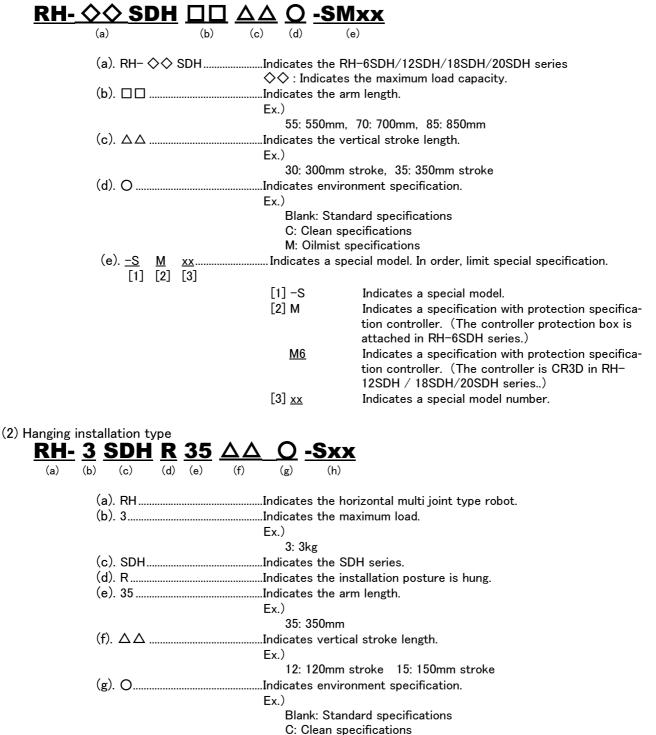
Materials and parts for the maintenance use.

1.2 Model type name of robot

1.2.1 How to identify the robot model

This robot has arranged the type name corresponding to load mass, arm length, and environment specification. Since details are shown below, please select the robot suitable for the customer's use.

(1) Floor installation type



W: Waterproof specifications (h). <u>-Sxx</u>......Indicates a special model. In order, limit special specification.

1.2.2 Combination of the robot arm and the controller

Table 1-1: Combination of the robot arm (floor installation type) and the controller

Protection specification	Robot arm	Arm length (mm)	J3-axis stroke (mm)	Controller ^{Note1)}
H-6SDH series			<u></u>	
General-purpose environment	RH-6SDH3520	350		
	RH-6SDH4520	450	200	
	RH-6SDH5520	550		
	RH-6SDH3532	350		
	RH-6SDH4532	450	320	
	RH-6SDH5532	550		
Clean specifications	RH-6SDH3517C	350		
	RH-6SDH4517C	450	170	
	RH-6SDH5517C	550		
	RH-6SDH3527C	350		CR1DA-761
	RH-6SDH4527C	450	270	
	RH-6SDH5527C	550	270	
Oil mist specifications	RH-6SDH3517M	350		
on mist specifications	RH-6SDH4517M	450	170	
	RH-6SDH5517M	550	170	
		350		
	RH-6SDH3527M		270	
	RH-6SDH4527M	450	270	
11 100011	RH-6SDH5527M	550		
H-12SDH series	DIL 100DUEE0E	EEO	į.	
General-purpose environment	RH-12SDH5535	550	050	
	RH-12SDH7035	700	350	
	RH-12SDH8535	850		
	RH-12SDH5545	550		
	RH-12SDH7045	700	450	
	RH-12SDH8545	850		
Clean specifications	RH-12SDH5530C	550		
	RH-12SDH7030C	700	300	
	RH-12SDH8530C	850		0000 4 744
	RH-12SDH5538C	550		CR2DA-741
	RH-12SDH7038C	700	380	
	RH-12SDH8538C	850		
Oil mist specifications	RH-12SDH5530M	550		
	RH-12SDH7030M	700	300	
	RH-12SDH8530M	850	330	
	RH-12SDH5538M	550		
	RH-12SDH7038M	700	380	
	RH-12SDH7036M	850	300	
H-18SDH series	TATE TEGET TO SOUN	000		
General-purpose environment	RH-18SDH8535		350	
Clean specifications	RH-18SDH8530C	850	330	CR2DA-751
· · · · · · · · · · · · · · · · · · ·	RH-18SDH8530M	- 650	300	ONZDA-191
Oil mist specifications H-20SDH series	VU-109DU0390M			
General-purpose environment	RH-20SDH8535	850		
General-purpose environment	RH-20SDH8535	1000	350	
	RH-20SDH10035	850		
	RH-20SDH8545	1000	450	
Class appoifications	RH-20SDH10045	850		
Clean specifications	RH-20SDH8530C	1000	300	
				CR2DA-751
	RH-20SDH8538C	850	380	
0.1	RH-20SDH10038C	1000		
	RH-20SDH8530M	850	300	
Oil mist specifications	DIT 000D1110000F4	1000	300	
Oil mist specifications	RH-20SDH10030M RH-20SDH8538M	1000 850	300	

Note1) When you use by adverse environment, please use the protection specification controller.

RH-6SDH series The controller protection box is attached. (IP54)

(Ex.: RH-6SDH3520-SM)

RH-12SDH/18SDH/20SDH series......: Protection specification controller : CR3D-700M(IP54)

(Ex.: RH-12SDH5535-SM6)

Table 1-2: Combination of the robot arm (hanging installation type) and the controller

Protection specification	Robot arm	Arm length (mm)	J3-axis stroke (mm)	Controller
RH-3SDHR series				
General-purpose environment	RH-3SDHR3515	350	150	
Clean environment	RH-3SDHR3512C	350	120	CR2DA-781
Waterproof (IP65) specification	RH-3SDHR3512W	350	120	

1.3 CE marking specifications

The robot shown in the table is the CE Marking specification.

Table 1-3: Robot models with CE marking specifications

Robot type	Controller	External signal logic	Language setting	
RH-6SDH*-S12/S15	CR1DA-761-S12/S15			
RH-6SDH*-S312	CR2DA-761-S312		English (ENG)	
RH-12SDH*-S12	CR2DA-741-S12	Sauraa tura		
RH-12SDH*-SM612	CR3D-741-SM612	Source type	English (ENG)	
RH-18SDH*-S12	CR2DA-751-S12			
RH-18SDH*-SM612	CR3D-751-SM612			

1.4 Indirect export

The display in English is available by setting parameter LNG as "ENG."

1.5 Instruction manuals

The instruction manuals supplied in CD-ROM, except for the Safety Manual. This CD-ROM (electronic manual) includes instruction manuals in both Japanese and English versions.

1.6 Contents of the structural equipment

1.6.1 Robot arm

The list of structural equipment is shown in Fig. 1-1, Fig. 1-2.

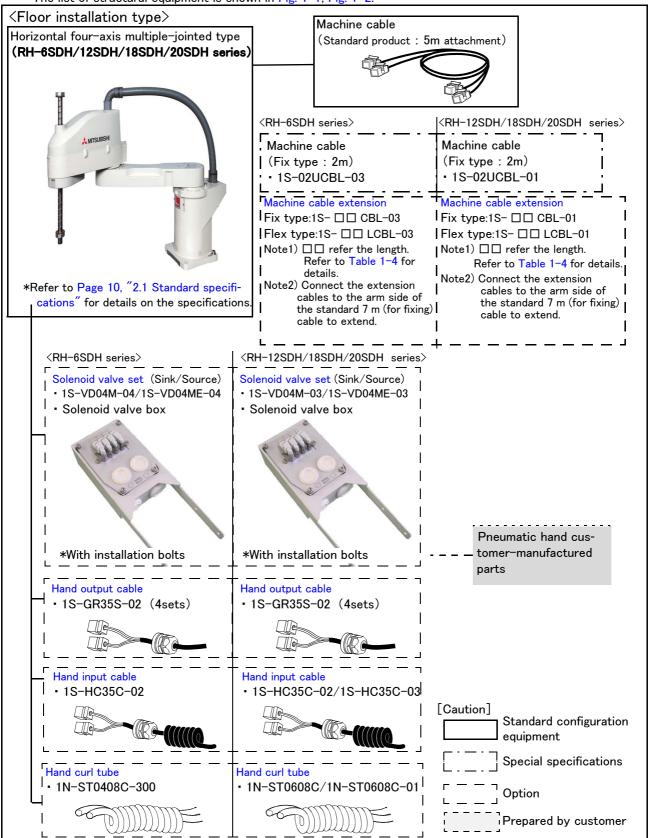


Fig.1-1: Structural equipment (Floor installation type)

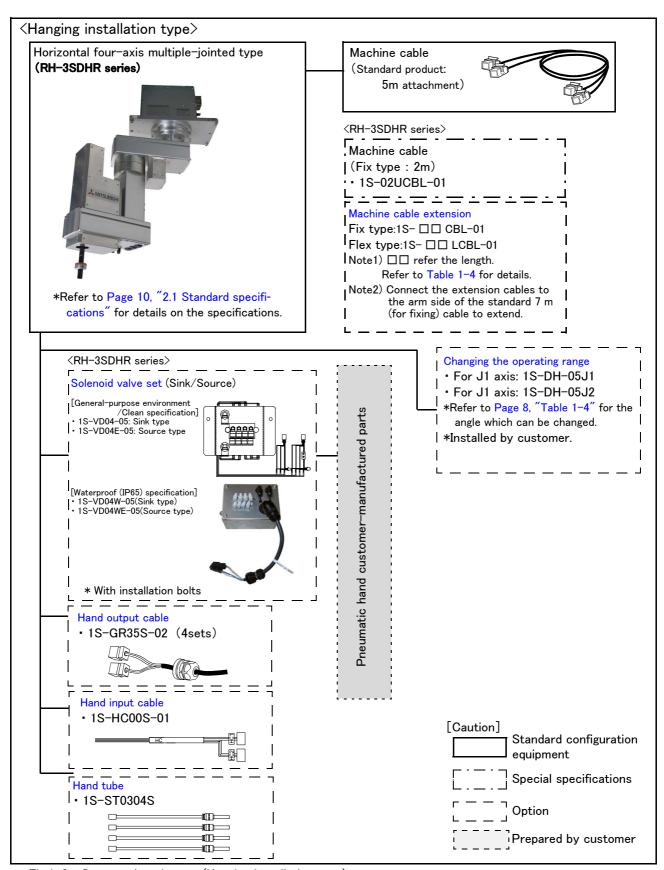


Fig.1-2: Structural equipment (Hanging installation type)

1.6.2 Controller

The devices shown below can be installed on the controller.

The controllers that can be connected differ depending on the specification of the robot.

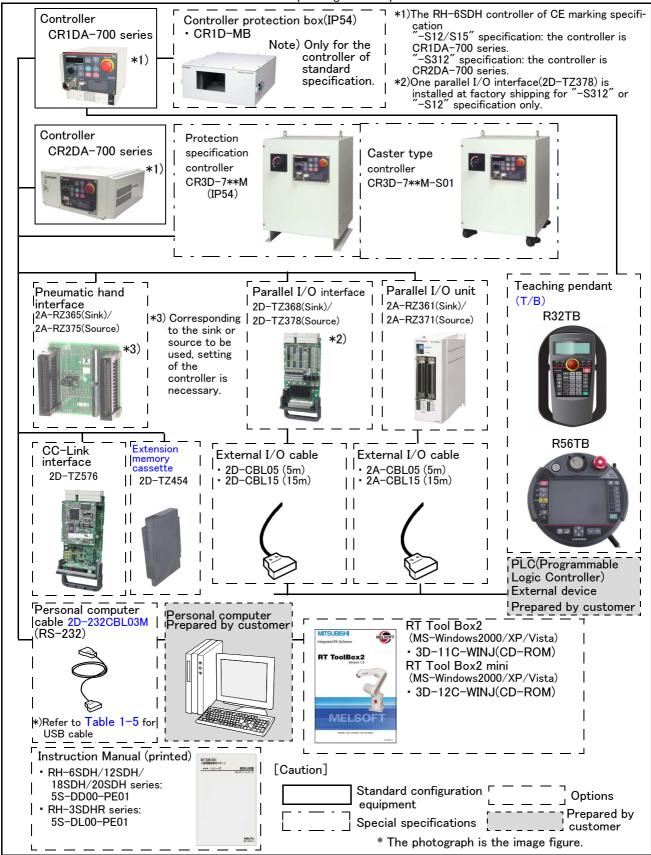


Fig.1-3: Structural equipment

1.7 Contents of the Option equipment and special specification

A list of all Optional equipments and special specifications are shown below.

Table 1-4: The list of Option equipment and special specification

Item	Туре	Specifications	Classification Note1)	Description
Stopper for changing the operating range	1S-DH-05J1	RH-3SDHR series The stopper parts for J1 axis Plus side / Minus side both are 90 degree. * Change both simultaneously Standard specification is +/- 225 degree.	0	
	1S-DH-05J2	RH-3SDHR series The stopper parts for J2 axis Plus side / Minus side both are 60 degree. * Change both simultaneously Standard specification is +/- 225 degree.	0	This must be installed by the customer.
Machine cable (Replaced with shorter cable)	1S-02UCBL-03	RH-6SDH for fixing (Set of power and signal)	0.0	2m(A 2 m cable is supplied instead of the 5 m
	1S-02UCBL-01	RH-12SDH/18SDH/20SDH series, RH-3SDHR series for fixing (Set of power and signal)	0.0	cable that is supplied as standard)
Extended machine cable	1S-	RH-6SDH for fixing (Set of power and signal)	0	
	1D-	RH-6SDH for bending (Set of power and signal) RH-12SDH/18SDH/20SDH series.	0	
		RH-3SDHR series for fixing (Set of power and signal)	0	5、10、15m
	1D- 🗆 LCBL-01	RH-12SDH/18SDH/20SDH series, RH-3SDHR series for bending (Set of power and signal)	0	
Solenoid valve set	1S-VD04M-04/ 1S-VD04ME-04	RH-6SDH series 4 set (Sink type)/(Source type)	0	1S-VD04M-04: Sink type 1S-VD04ME-04: Source type
	1S-VD04M-03/ 1S-VD04ME-03	RH-12SD/18DH/20DH series 4 set (Sink type)/(Source type)	0	1S-VD04M-03: Sink type 1S-VD04ME-03: Source type
	1S-VD04-05/ 1S-VD04E-05	RH-3SDHR series 4 set (Sink type)/(Source type)	0	Standard specification and clean specification 1S-VD04-05: Sink type 1S-VD04E-05: Source type
	1S-VD04W-05/ 1S-VD04WE-05	RH-3SDHR series 4 set (Sink type)/(Source type)	0	Waterproof (IP65) specification 1S-VD04W-05: Sink type 1S-VD04WE-05: Source type
Hand output cable	1S-GR35S-02	Robot side: connector. Hand side: wire.	0	The cable is connected to the hand output connector by the customer.
Hand input cable	1S-HC35C-02	Robot side: connector. Hand side: wire.	0	The cable is connected to the sensor by the customer. RH-6SDH/12SDH/18SDH/20SDH85** series.
	1S-HC35C-03	Robot side: connector. Hand side: wire.	0	The cable is connected to the sensor by the customer. RH-20SDH100** series.
	1S-HC00S-01	For four points	0	The cable is connected to the sensor through the ball screw shaft by the customer. RH-3SDHR series
Hand curl tube	1E-ST0408C-300	For solenoid valve 4set.:Φ4x8	0	Curl type air tube 1E-ST0408C-300:
	1N-ST0608C	For solenoid valve 4set.:Φ6x8	0	RH-6SDH series 1N-ST0608C:
	1N-ST0608C-01	For solenoid valve 4set.:Φ6x8	0	RH-12SDH/18SDH/20SDH85** series 1N-ST0608C-01: RH-20SDH100** series
Hand tube	1S-ST0304S	Ф 3х4	0	The tube for piping the hand through the ball screw shaft by the customer. RH-3SDHR series
Simple teaching pendant	R32TB	Cable length 7m	0	
	R32TB-15	Cable length 15m	0	 With 3–position deadman switch IP65
Highly efficient teaching	R56TB	Cable length 7m	0	- Postania adaman omeon a oo
pendant	R56TB-15	Cable length 15m	0	
Pneumatic hand interface 2A-RZ365 2A-RZ375		DO: 8 point(Sink type)	0	It is necessary when the hand output signal of the robot arm is used.
	2A-RZ375	DO: 8 point(Source type)	0	

Item	Туре	Specifications	Classification Note1)	Description
Parallel I/O Interface	2D-TZ368	DO: 32 point (Sink type)/ DI: 32 point (Sink type) Insulated type output signal (100mA/ point)	0	The card type external input-and-output.
	2D-TZ378	DO: 32 point (Source type)/ DI: 32 point (Source type) Insulated type output signal (100mA/ point)	O ^{Note2)}	Interface.Install to the slot of controller.
External I/O cable	2D-CBL05	5m	0	Use to connect the external peripheral device
(For Parallel I/O Interface)	2D-CBL15	15m	0	to the parallel input/output interface.
Parallel I/O Unit	2A-RZ361	DO: 32 point (Sink type)/ DI: 32 point (Sink type)	0	The unit for expansion the external input/out-
	2A-RZ371	DO: 32 point (Source type)/ DI: 32 point (Source type)	0	Electrical isolated Type (100mA/Point)
	2A-CBL05	5m	0	Use to connect the external peripheral device
(For Parallel I/O Unit)	2A-CBL15	15m	0	to the parallel input/output unit
CC-Link interface	2D-TZ576	Local station	0	for MELSEC PLC with CC-Link connection.
Extended memory cassette	2D-TZ454	Teaching point number: 50,800 Steps number: 50,800 Program number: 512	0	The battery backup function is provided. The value combined with the standard
Controller protection box Note3)	CR1D-MB	IP54		The controller protection box is used to protect the controller from an oil mist or other operating environment
Caster specifications controller	CR3D-700M	Specifications with casters		The controller height will be h =615
RT ToolBox2 (Personal computer Sup- port software)	3D-11C-WINE	CD-ROM	0	MS-Windows2000/XP/Vista (With the simulation function)
RT ToolBox2 mini (Personal computer Sup- port software mini)	3D-12C-WINE	CD-ROM	0	MS-Windows2000/XP/Vista
Personal computer cable ^{Note4)}	2D-232CBL03M	RS-232C cable 3m for PC-AT compatible model	0	
Instruction Manual	5S-DD00-PE01	RH-6SDH/12SDH/18SDH/20SDH series	0	A set of the instructions manual bookbinding editions
	5S-DL00-PE01	RH-3SDHR series	0	

Note1) \bigcirc : option, \square : special specifications. Note2) One 2D-TZ378(Source type) is installed for CE Marking specification at shipping. (Only "-S312" or "-S12" specification)

Note3) This is provided as standard for the specification with the controller protection box. Use this option to protect the controller from the oil mist when the controller will be installed in the environment such as the oil

Only for the CR1DA-700 series controller of standard specification.

Note4) The recommendation products of the USB cable are shown in Table 1-5.

[Reference]: The recommendation products of the USB cable are shown below.

Table 1-5: Recommendation article of the USB cable

Name	Type name	Supplier
USB cable	KU-AMB530	SANWA SUPPLY INC.
(USB A type-USB mini B type)	USB-M53	ELECOM CO., LTD.
	GT09-C30USB-5P	MITSUBISHI ELECTRIC SYSTEM & SERVICE CO., LTD.
	MR-J3USBCBL3M	MITSUBISHI ELECTRIC CO., LTD.
USB adapter (USB B type-USB mini B type)	AD-USBBFTM5M	ELECOM CO., LTD.



Caution Be careful to the USB cable to apply neither the static electricity nor the noise. Otherwise, it becomes the cause of malfunction.



Caution Use the network equipments (personal computer, USB hub, LAN hub, etc) confirmed by manufacturer. The thing unsuitable for the FA environment (related with conformity, temperature or noise) exists in the equipments connected to USB, RS-232 or LAN. When using network equipment, measures against the noise, such as measures against EMI and the addition of the ferrite core, may be necessary. Please fully confirm the operation by customer. Guarantee and maintenance of the equipment on the market (usual office automation equipment) cannot be performed.

2 Robot arm

2.1 Standard specifications

(1) RH-6SDH series

Table 2-1: Tab Standard specifications of robot (Standard Specification)

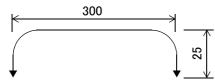
Item	arradi d opo	Unit	Specifications					
Type ^{Note1)}			RH-6SDH3520/3532	RH-6SDH4520/4532	RH-6SDH5520/5532			
Environment				Standard specification				
Installation posture				On floor				
Degree of freedom				4				
Structure				Horizontal, multiple-joint type				
Drive system				AC servo motor				
Position detection metho	od			Absolute encoder				
Motor capacity	J1	W		400				
	J2	W		100				
	J3 (Z)	W		100				
	J4 (<i>θ</i> axis)	W		100				
Brake			J	11, J2, J4 : no brake J3 : with brak	e			
Arm length	No. 1 arm	mm	125	225	325			
	No. 2 arm	mm		225				
Max.reach radius(No. 1+ N	lo. 2)	mm	350	450	550			
Operating range	J1	deg		254(±127)				
L	J2	deg	$274(\pm 137)$ $290(\pm 145)$					
	J3 (Z)	mm	RH-6SDH3520/H4520/H5520 : 200 (+97 to 297) RH-6SDH3532/H4532/H5532 : 320 (-23 to 297)					
	J4 (<i>θ</i> axis)	deg		720(±360)				
Speed of motion	J1	deg/s	375					
	J2	deg/s	612					
	J3 (Z)	mm/s	1,177					
	J4 (<i>θ</i> axis)	deg/s	2,411					
Maximum horizontal com Note2)	posite speed	mm/s	6,473<4,694> 7,128<5,349>		7,782(6,003)			
Cycle time ^{Note3)}		sec	0.42	0.42	0.43			
Land	Rating	kg		2 (19.6)				
Load	Maximum	(N)		6 (58.8)				
Allowable	Rating	kg·m²		0.01				
inertia	Maximum	kg · m		0.04				
Pose repeatability Note4)	X-Y direction	mm		±0.02				
	J3 (Z)	mm		±0.01				
	J4 (<i>θ</i> axis)	deg		±0.02				
Ambient temperature		°C		0 to 40				
Mass		k	20	2	1			
Tool wiring Note5)			Input 8	points/Output 8 points, eight spar	e wires			
Tool pneumatic pipes				Φ6×2				
Supply pressure		MPa		0.5±10% (
Protection specification ^N	lote6)			IP20				
Painting color			Light gra	y(Equivalent to Munsell:0.08GY7	.46/0.81)			

Note1) The type in which operating range of J3 axis (Z) is 200mm and 320mm is shown together.

Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are composed.

Note3) Values of the operation below at rated load capacity.

·The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".

Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.

Note6) The protection specification details are given in Page 35, "2.2.8 Protection specifications". When using the robot in the oil mist environment etc., please choose oil mist specification (Table 2-3).

Table 2-2: Tab Standard specifications of robot (Clean Specification)

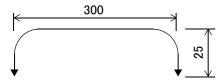
Item		Unit	Specifications				
Type ^{Note1)}			RH-6SDH3517C/3527C	RH-6SDH4517C/4527C	RH-6SDH5517C/5527C		
Environment				Clean specification			
Installation posture				On floor			
Degree of freedom				4			
Structure				Horizontal, multiple-joint type			
Drive system				AC servo motor			
Position detection metho	od			Absolute encoder			
Motor capacity	J1	W		400			
	J2	W		100			
	J3 (Z)	W		100			
	J4 (<i>θ</i> axis)	W		100			
Brake	•			I1, J2, J4 : no brake J3 : with bral	ke		
Arm length	No. 1 arm	mm	125	225	325		
	No. 2 arm	mm		225	•		
Max.reach radius(No. 1+ N	No. 2)	mm	350	450	550		
Operating range	J1	deg		254(±127)			
, ,	J2	deg	$274(\pm 137)$ $290(\pm 145)$				
	J3 (Z)		RH-6SDH3517C/4517C/5517C : 170 (+97 to 267)				
		mm	RH-6SD)H3527C/4527C/5527C : 270 (-2	3 to 247)		
,	J4 (<i>θ</i> axis)	deg	720(±360)				
Speed of motion	J1	deg/s	375				
	J2	deg/s	612				
	J3 (Z)	mm/s	1,177				
	J4 (<i>θ</i> axis)	deg/s	2,411				
Maximum horizontal com Note2)	posite speed	mm/s	6,473<4,694>	7,128<5,349>	7,782<6,003>		
Cycle time ^{Note3)}		sec	0.45	0.46	0.47		
	Rating	kg		2 (19.6)	1		
Load	Maximum	(N)		6 (58.8)			
Allowable	Rating	kg·m²		0.01			
inertia	Maximum	κg·m-		0.04			
Pose repeatability ^{Note4)}	X-Y direction	mm	±0.02				
	J3 (Z)	mm		±0.01			
	J4 (θ axis)	deg		±0.02			
Ambient temperature		°C	0 to 40				
Mass		kg	20		21		
Tool wiring Note5)			Input 8	B points/Output 8 points, eight spar	re wires		
Tool pneumatic pipes		†	,pac	Φ6×2			
Supply pressure		MPa		0.5±10%			
Degree of cleanliness ^{Note}	e6)			10(0.3 μ m)			
Painting color		†	Light øra	y (Equivalent to Munsell : 0.08GY7	7.46/0.81)		
			Eight gra	, ,,	/		

Note1) The type in which operating range of J3 axis (Z) is 170mm and 270mm is shown together.

Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are com-

Note3) Values of the operation below at rated load capacity.

·The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".

Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.

Note6) The details of the clean specifications are described in Page 38, "2.2.9 Clean specifications". Protection of the cleanness of the robot is required if the down flow in a clean room is 0.3 m/s or more and robot internal suction is 60 NL/min. A ϕ 8 joint is prepared at the base rear part for suction.

Table 2-3: Tab Standard specifications of robot (Oil mist Specification)

Item		Unit	Specifications				
Type ^{Note1)}			RH-6SDH3517M/3527M	RH-6SDH4517M/4527M	RH-6SDH5517M/5527M		
Environment				Oil mist specification	I.		
Installation posture				On floor			
Degree of freedom				4			
Structure				Horizontal, multiple-joint type			
Drive system				AC servo motor			
Position detection metho	od			Absolute encoder			
Motor capacity	J1	W		400			
	J2	W		100			
	J3 (Z)	W		100			
	J4 (<i>θ</i> axis)	W		100			
Brake				I1, J2, J4 : no brake J3 : with brak	ке		
Arm length	No. 1 arm	mm	125	225	325		
İ	No. 2 arm	mm		225			
Max.reach radius(No. 1+ I	Vo. 2)	mm	350	450	550		
Operating range	J1	deg		254(±127)	I		
	J2	deg	274(±137)	290(:	±145)		
	J3 (Z)		RH-6SD	7 to 267)			
-		mm	RH-6SD	3 to 247)			
	J4 (<i>θ</i> axis)	deg	720(±360)				
Speed of motion	J1	deg/s	375				
	J2	deg/s	612				
	J3 (Z)	mm/s		1,177			
	J4 (<i>θ</i> axis)	deg/s	2,411				
Maximum horizontal com Note2)	posite speed	mm/s	6,473<4,694>	7,128<5,349>	7,782<6,003>		
Cycle time ^{Note3)}		sec	0.45	0.46	0.47		
	Rating	kg		2 (19.6)			
Load	Maximum	(N)		6 (58.8)			
Allowable	Rating	12		0.01			
inertia	Maximum	kg·m ²		0.04			
Pose repeatability Note4)	X-Y direc- tion	mm		±0.02			
	J3 (Z)	mm		±0.01			
	J4 (<i>θ</i> axis)	deg		±0.02			
Ambient temperature		°C		0 to 40			
Mass		kg	20	2	21		
Tool wiring Note5)		_	Input 8	B points/Output 8 points, eight spar	re wires		
Tool pneumatic pipes			·	Φ6×2			
Supply pressure		MPa		0.5±10%			
Protection specification	lote6) Note7)			IP54			
Painting color			Light gra	y (Equivalent to Munsell : 0.08GY7	'.46/0.81)		

Note1) The type in which operating range of J3 axis (Z) is 170mm and 270mm is shown together.

Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are com-

Note3) Values of the operation below at rated load capacity.

•The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".

Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.

Note6) The protection specification details are given in Page 35, "2.2.8 Protection specifications".

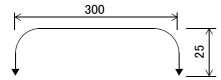
Note7) If you intend to use the controller in oil mist or similar environments, use the controller protection box (CR1B-MB) to protect the controller from the operation environment. A robot equipped with the controller protection box as standard is available(indicated with "-SM" on type).

(2) RH-12SDH series

Table 2-4: Tab Standard specifications of robot (Standard Specification)

	<u> </u>		<u>'</u>	·			
Item		Unit	Specifications				
Type ^{Note1)}			RH-12SDH5535/5545	RH-12SDH7035/7045	RH-12SDH8535/8545		
Environment				Standard specification			
Installation posture				On floor			
Degree of freedom				4			
Structure				Horizontal, multiple-joint type			
Drive system				AC servo motor			
Position detection method	od			Absolute encoder			
Motor capacity	J1	W		750			
	J2	W		400			
	J3 (Z)	W		200			
	J4 (<i>θ</i> axis)	W		100			
Brake	•			J1, J2, J4 : no brake J3 : with bral	(e		
Arm length	No. 1 arm	mm	225	375	525		
	No. 2 arm	mm		325			
Max.reach radius(No. 1+ I	No. 2)	mm	550	700	850		
Operating range	J1	deg		280(±140)			
	J2	deg	290(:	306(±153)			
	J3 (Z)	mm	RH-12SDH5535/7035/8535 : 350 (-10 to 340) RH-12SDH5545/7045/8545 : 450 (-110 to 340)				
	J4 (<i>θ</i> axis)	deg	720(±360)				
Speed of motion	J1	deg/s	360 288				
•	J2	deg/s	412.5				
	J3 (Z)	mm/s	1,300				
	J4 (<i>θ</i> axis)	deg/s	1.500				
Maximum horizontal com Note2)	posite speed	mm/s	10,555<5,796>	11,498<6,738>	11,221<6,612>		
Cycle time ^{Note3)}		sec	0.43	0.44	0.46		
	Rating	kg		2 (19.6)			
Load	Maximum	(N)		12 (117.6)			
Allowable	Rating	. 2		0.02			
inertia	Maximum	kg·m ²		0.1			
Pose repeatability Note4)	X-Y direction	mm	±0.02	±0	.025		
	J3 (Z)	mm		$\pm 0.01(\pm 3^{-5})$			
	J4 (<i>θ</i> axis)	deg		±0.03			
Ambient temperature		°C		0 to 40			
Mass		kg	41	43	45		
Tool wiring Note5)			Input 8	B points/Output 8 points, eight spar	e wires		
Tool pneumatic pipes			,	Φ6×2			
Supply pressure		MPa		0.5±10%			
Protection specification Note6)		1	0.5±10% IP20				
Protection specification	Painting color		Light gray (Equivalent to Munsell : 0.08GY7.46/0.81)				

- Note1) The type in which operating range of J3 axis (Z) is 350mm and 450mm is shown together.
- Note2) The value when J1, J2 and J4 are composed. The value in "<> " is the value when J1 and J2 are composed.
- Note3) Values of the operation below at rated load capacity.
- •The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.

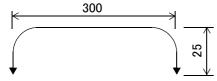


- Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".
- Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.
- Note6) The protection specification details are given in Page 35, "2.2.8 Protection specifications". When using the robot in the oil mist environment etc., please choose oil mist specification (Table 2-6).

Table 2-5: Tab Standard specifications of robot (Clean Specification)

Item		Unit	Specifications					
Type ^{Note1)}			RH-12SDH5530C/5538C RH-12SDH7030C/7038C RH-12SDH8530C/8538					
Environment				Clean specification				
Installation posture				On floor				
Degree of freedom				4				
Structure				Horizontal, multiple-joint type				
Drive system				AC servo motor				
Position detection metho	od			Absolute encoder				
Motor capacity	J1	W		750				
	J2	W		400				
	J3 (Z)	W		200				
	J4 (<i>θ</i> axis)	W		100				
Brake			J	I1, J2, J4 : no brake J3 : with brak	(e			
Arm length	No. 1 arm	mm	225	375	525			
	No. 2 arm	mm		325				
Max.reach radius(No. 1+ N	Vo. 2)	mm	550	700	850			
Operating range	J1	deg		280(±140)				
	J2	deg	290(=	290(±145) 306(±				
	J3 (Z)		RH-12SDH5530C/7030C/8530C : 300 (-10 to 290)					
		mm	RH-12SD	H5538C/7038C/8538C : 380 (-11	0 to 270)			
	J4 (<i>θ</i> axis)	deg	720(±360)					
Speed of motion	J1	deg/s	360 288					
	J2	deg/s	412.5					
	J3 (Z)	mm/s	1,300					
	J4 (<i>θ</i> axis)	deg/s	1,500					
Maximum horizontal com Note2)	posite speed	mm/s	10,555<5,796> 11,498<6,738>		11,221<6,612>			
Cycle time ^{Note3)}		sec	0.43	0.44	0.46			
I I	Rating	kg		2 (19.6)				
Load	Maximum	(N)		12 (117.6)				
Allowable	Rating	. 2		0.02				
inertia	Maximum	kg·m ²		0.1				
Pose repeatability Note4)	X-Y direc- tion	mm	±0.02	±0	.025			
	J3 (Z)	mm		±0.01				
	J4 (θ axis)	deg		±0.03				
Ambient temperature		°C		0 to 40				
Mass		kg	41	43	45			
Tool wiring Note5)		_	Input 8	B points/Output 8 points, eight spar	e wires			
Tool pneumatic pipes			·	Φ6×2				
Supply pressure		MPa		0.5±10%				
Degree of cleanliness ^{Note}	e6)			10(0.3 μ m)				
Painting color			Light gra	y(Equivalent to Munsell:0.08GY7	.46/0.81)			

- Note1) The type in which operating range of J3 axis (Z) is 300mm and 380mm is shown together.
- Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are com-
- Note3) Values of the operation below at rated load capacity.
- ·The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



- Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".
- Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.
- Note6) The details of the clean specifications are described in Page 38, "2.2.9 Clean specifications" To secure cleanliness, a clean room down flow of 0.3 m/s or more and an internal robot suction of 60 NL/min are required. A coupling of ϕ 8 is provided in the rear of the base for suction.

Table 2-6: Tab Standard specifications of robot (Oil mist Specification)

			•					
Item		Unit	Specifications					
Type ^{Note1)}			RH-12SDH5530M/5538M	RH-12SDH7030M/7038M	RH-12SDH8530M/8538M			
Environment			Oil mist specification					
Installation posture				On floor				
Degree of freedom				4				
Structure				Horizontal, multiple-joint type				
Drive system				AC servo motor				
Position detection metho	od			Absolute encoder				
Motor capacity	J1	W		750				
	J2	W		400				
	J3 (Z)	W		200				
	J4 (<i>θ</i> axis)	W		100				
Brake	•			J1, J2, J4 : no brake J3 : with brak	(e			
Arm length	No. 1 arm	mm	225	375	525			
	No. 2 arm	mm		325				
Max.reach radius(No. 1+ I	Vo. 2)	mm	550	700	850			
Operating range	J1	deg		280(±140)				
	J2	deg	$290(\pm 145)$ $306(\pm 153)$					
	J3 (Z)	_	RH-12SDH5530M/7030M/8530M : 300 (-10 to 290)					
		mm	RH-12SDH5538M/7038M/8538M: 380 (-110 to 270)					
	J4 (<i>θ</i> axis)	deg	720(±360)					
Speed of motion	J1	deg/s	360 288					
	J2	deg/s	412.5					
	J3 (Z)	mm/s	1,300					
	J4 (<i>θ</i> axis)	deg/s	1,500					
Maximum horizontal com Note2)	posite speed	mm/s	10,555<5,796>	11,498<6,738>	11,221<6,612>			
Cycle time ^{Note3)}		sec	0.43	0.44	0.46			
	Rating	kg		2 (19.6)				
Load	Maximum	(N)		12 (117.6)				
Allowable	Rating	. 2		0.02				
inertia	Maximum	kg·m²		0.1				
Pose repeatability Note4)	X-Y direction	mm	±0.02	±0	.025			
	J3 (Z)	mm		±0.01				
	J4 (θ axis)	deg		±0.03				
L L		°C		0 to 40				
Mass		kg	41	43	45			
Tool wiring Note5)		0		B points/Output 8 points, eight spar				
Tool pneumatic pipes			,	Φ6×2				
Supply pressure		MPa		0.5±10%				
Protection specification ^N	lote6) Note7)			IP54				
Painting color			light gra		.46/0.81)			
Fairting Color			Light gray (Equivalent to Munsell : 0.08GY7.46/0.81)					

- Note1) The type in which operating range of J3 axis (Z) is 300mm and 380mm is shown together.
- Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are com-

Note3) Values of the operation below at rated load capacity.

·The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



- Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".
- Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.
- Note6) The protection specification details are given in Page 35, "2.2.8 Protection specifications".
- Note7) When using the controller in an oil mist environment, etc., select the oil mist compatible controller specifications (indicated with "-SM" on type). The CR3-535M controller, compatible with an oil mist environment, is available as factory-shipped special specifications.

(3) RH-18SDH series

Table 2-7: Tab Standard specifications of robot

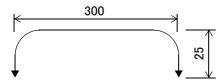
Item		Unit	Specifications Note1)				
Туре			RH-18SDH8535	RH-18SDH8530C	RH-18SDH8530M		
Environment			Standard specification	Clean specification	Oil mist specification		
Installation posture			-	On floor	-		
Degree of freedom				4			
Structure				Horizontal, multiple-joint type			
Drive system				AC servo motor			
Position detection metho	od			Absolute encoder			
Motor capacity	J1	W		750			
†	J2	W		400			
†	J3 (Z)	W		400			
†	J4 (<i>θ</i> axis)	W		100			
Brake			J1, c	J2 : no brake J3, J4 : with brake	9		
Arm length	No. 1 arm	mm		525			
	No. 2 arm	mm		325			
Max.reach radius(No. 1+ N		mm		850			
Operating range	J1	deg		280(±140)			
oporating rango	J2	deg		306(±153)			
	J3 (Z)	mm	350(-10 to 340) 300(-10 to 290)				
	J4 (θ axis)	deg	720(±360)				
Speed of motion	J1	deg/s	288				
opeca of model	J2	deg/s	412.5				
	J3 (Z)	mm/s	1,200				
	J4 (θ axis)	deg/s	1,500				
Maximum horizontal com	, , , ,	mm/s		11,221 <6,612>			
Note2)							
Cycle time ^{Note3)}		sec		0.53			
Load	Rating	kg		5 (49.0)			
	Maximum	(N)		18 (176.5)			
Allowable	Rating	kg·m²		0.02			
inertia	Maximum	1.6		0.2			
Pose repeatability Note4)	X-Y direc- tion	mm		±0.025			
	J3 (Z)	mm		±0.01			
	J4 (θ axis)	deg		±0.03			
Ambient temperature	OT (O UXIO)	°C		0 to 40			
Mass		kg		47			
Tool wiring Note5)		1/6	Input 8 po	ints/Output 8 points, eight spare	wires		
Tool pneumatic pipes		+	input o po	Φ6×2	55		
Supply pressure		MPa		0.5±10%			
Protection specification ^N	ote6) Note7)	IVII G	IP20		IP54		
Degree of cleanliness Note		-	<u> </u>	10(0.3 μ m)			
				Equivalent to Munsell : 0.08GY7.4			

Note1) The table is joint writing on the General environment and clean and oil mist specification.

Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are com-

Note3) Values of the operation below at rated load capacity.

· The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".

Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.

Note6) The protection specification details are given in Page 35, "2.2.8 Protection specifications".

Note7) When using the controller in an oil mist environment, etc., select the oil mist compatible controller specifications (indicated with "-SM" on type). The CR3-535M controller, compatible with an oil mist environment, is available as factory-shipped special specifications.

Note8) The details of the clean specifications are described in Page 38, "2.2.9 Clean specifications" To secure cleanliness, a clean room down flow of 0.3 m/s or more and an internal robot suction of 60 NL/min are required. A coupling of ϕ 8 is provided in the rear of the base for suction.

(4) RH-20SDH series

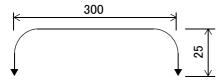
Table 2-8: Tab Standard specifications of robot (Standard Specification)

Type	Item		Unit	Unit Specifications					
Installation posture Degree of freedom	Туре			RH-20SDH8535 RH-20SDH8545 RH-20SDH10035 RH-20SDH100					
Degree of freedom	Environment			Standard specification					
Structure	Installation posture		ĺ		On	floor			
Position detection method AC serve motor Absolute encoder Motor capacity J1 W 7 5 0 Motor capacity J3 (Z) W 3 2 5 0 A 0 0 Brake J1, J2 : no brake J3, J4 : with brake Arm length No. 1 arm mm 5 2 5	Degree of freedom					4			
Position detection method Motor capacity Motor capacity J1	Structure				Horizontal, mu	ltiple-joint type			
Motor capacity A	Drive system				AC ser	vo motor			
1	Position detection method	od			Absolute	e encoder			
Brake	Motor capacity	J1	W		7	5 0			
Brake		J2	W		4	0 0			
Brake J1, J2 : no brake J3, J4 : with brake Arm length No. 1 arm mm 5 2 5 5 2 5 5 2 5 4 7 5 4 7 5 4		J3 (Z)	W		4	0 0			
Arm length No. 1 arm mm 5 ≥ 5 4 7 5 Max.reach radius(No.1+ No.2) mm 8 5 0 1 7 5 Operating range J deg 2 8 0 (± 1 4 0) Jaccord mm 350(-10 ~ 340) 450(-110 ~ 340) 350(-10 ~ 340) 450(-110 ~ 340) <t< td=""><td></td><td>J4 (<i>θ</i> axis)</td><td>W</td><td></td><td>1</td><td>0 0</td><td></td></t<>		J4 (<i>θ</i> axis)	W		1	0 0			
Max.reach radius (No. 1+ No. 2) mm 8 5 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Brake				J1, J2 : no brake	J3, J4 : with brake			
Max.reach radius (No. 1+ No. 2) mm 8 5 0 1 0 0 Operating range J1 deg 2 8 0 (± 1 4 0) J2 deg 3 0 6 (± 1 5 3) J3 (2) mm 350(-10 ~ 340) 450(-110 ~ 340) 350(-10 ~ 340) 450(-110 ~ 340) Speed of motion J1 deg/s 2 8 8 J2 deg/s 4 1 2 . 5 J3 (2) mm/s 1 , 2 0 0 J4 (θ axis) deg/s 1 , 2 0 0 Maximum horizontal corrections of Notes) mm/s 1 1 , 2 2 1 (6 , 6 1 2) 1 3 , 0 5 5 (8 , 4 4 6) Cycle time Note2) sec 0 . 5 3 0 . 6 9 Load Rating (N) Maximum Note (N) Note (N) Allowable inertia Rating (N) Maximum Note (N) ± 0 . 0 2 Pose repeatability Note3 (N) Note (N) ± 0 . 0 2 ± 0 . 0 3 0 Ambient temperature % ± 0 . 0 2 5 ± 0 . 0 3 0 Mass kg 4 7 4 8 5 0 . 0 5 Tool pricuratic pipes MPa <td< td=""><td>Arm length</td><td>No. 1 arm</td><td>mm</td><td>5 2</td><td>2 5</td><td>5 :</td><td>2 5</td></td<>	Arm length	No. 1 arm	mm	5 2	2 5	5 :	2 5		
Operating range JI deg 2 8 0 (± 1 4 0) J3 (2) mm 350(-10 ~ 340) 450(-110 ~ 340) 350(-10 ~ 340) 450(-110 ~ 340) 450(-		No. 2 arm	mm	3 2	2 5	4	7 5		
3	Max.reach radius(No. 1+ I	No. 2)	mm	8 5	5 0	1 0	0 0		
Maximum horizontal composite speed Maximum Maxim	Operating range	J1	deg		280 (± 140)			
Maximum horizontal composite speed Maximum Maxim		J2	deg		306 (± 153)			
Speed of motion J1 deg/s		J3 (Z)		350(-10 ~ 340)	450(-110 ~ 340)	350(-10 ~ 340)	450(-110 ~ 340)		
Speed of motion J1 deg/s		J4 (θ axis)	deg						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Speed of motion		+ +		2 8 8				
Maximum horizontal composite speed Note1)	·	J2		4 1 2 . 5					
Maximum horizontal composite speed Note1) mm/s 1 1 , 2 2 1 (6, 6 1 2) 1 3, 0 5 5 (8, 4 4 6) Cycle time Note2) sec 0. 53 0. 6 9 Load Rating Maximum kg Maximum 5 Allowable inertia Rating Maximum kg ⋅ m² 0. 0 2 Pose repeatability Note3) X-Y direction mm ± 0. 0 2 5 ± 0. 0 3 0 Ambient temperature °C 0 ~ 4 0 Mass kg 4 7 4 8 5 0 5 1 Tool wiring Note4) Input 8 points/Output 8 points, eight spare wires Tool pneumatic pipes MPa 0. 5 ± 1 0 % Protection specification Note5) IP 3 0		J3 (Z)	mm/s						
Maximum horizontal composite speed Note1) mm/s 1 1 , 2 2 1 (6, 6 1 2) 1 3, 0 5 5 (8, 4 4 6) Cycle time Note2) sec 0. 53 0. 6 9 Load Rating Maximum kg Maximum 5 Allowable inertia Rating Maximum kg ⋅ m² 0. 0 2 Pose repeatability Note3) X-Y direction mm ± 0. 0 2 5 ± 0. 0 3 0 Ambient temperature °C 0 ~ 4 0 Mass kg 4 7 4 8 5 0 5 1 Tool wiring Note4) Input 8 points/Output 8 points, eight spare wires Tool pneumatic pipes MPa 0. 5 ± 1 0 % Protection specification Note5) IP 3 0		J4 (θ axis)	deg/s		1,	5 0 0			
Load Rating Maximum kg (N) 5 Allowable inertia Rating Maximum kg ⋅ m² 0 ⋅ 0 ⋅ 2 Pose repeatability Note3) For inertia Maximum x-y direction mm ± 0 ⋅ 0 ⋅ 2 Pose repeatability Note3 from inertian 33 (Z) mm ± 0 ⋅ 0 ⋅ 2 ± 0 ⋅ 0 ⋅ 3 Ambient temperature °C 0 ∼ 4 0 0 ⋅ 0 ⋅ 0 ⋅ 0 ⋅ 0 ⋅ 0 ⋅ 0 ⋅ 0 ⋅ 0 ⋅ 0 ⋅		posite speed	mm/s	11, 221		13, 055	(8, 446)		
Load Maximum (N) 2 0 Allowable inertia Rating Maximum kg ⋅ m² 0 ⋅ 0 2 Pose repeatability Note3 tion X-Y direction mm ± 0 ⋅ 0 2 5 ± 0 ⋅ 0 3 0 Ambient temperature °C 0 ⋅ 4 0 0 ⋅ 4 0 Mass kg 4 7 4 8 5 0 5 1 Tool wiring Note4) Input 8 points/Output 8 points, eight spare wires Tool pneumatic pipes 0 ⋅ 5 ± 1 0 % Supply pressure MPa 0 ⋅ 5 ± 1 0 % Protection specification Note5) I P 3 0	Cycle time ^{Note2)}		sec	0.53 0.69			6 9		
Maximum Note Maximum Note Maximum Note Note	Lood	Rating	kg			5			
inertia Maximum kg · m² 0. 2 Pose repeatability Note3) X-Y direction ± 0. 0 2 5 ± 0. 0 3 0 J3 (Z) mm ± 0. 0 1 ± 0. 0 3 Ambient temperature °C 0 ~ 4 0 Mass kg 4 7 4 8 5 0 5 1 Tool wiring Note4) Input 8 points/Output 8 points, eight spare wires Tool pneumatic pipes Φ 6 × 2 Supply pressure MPa 0. 5 ± 1 0 % Protection specification Note5) I P 3 0	Load	Maximum			2	: 0			
Pose repeatability Note3 X-Y direction mm ± 0.025 ± 0.030	Allowable	Rating	2		0.	0 2			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Maximum	kg · m		0.	2			
	Pose repeatability Note3)		mm	± 0.	0 2 5	± 0.	030		
Ambient temperature °C 0 ~ 4 0 Mass kg 4 7 4 8 5 0 5 1 Tool wiring Note4) Input 8 points/Output 8 points, eight spare wires Tool pneumatic pipes Φ 6 × 2 Supply pressure MPa 0 · 5 ± 1 0 % Protection specification Note5) I P 3 0		J3 (Z)	mm		± 0	. 01			
Mass kg 4.7 4.8 5.0 5.1 Tool wiring Note4) Input 8 points/Output 8 points, eight spare wires Tool pneumatic pipes Φ 6 × 2 Supply pressure MPa 0.5 ± 1.0% Protection specification Note5) I P 3.0		J4 (<i>θ</i> axis)	deg		± 0	. 03			
Tool wiring Note4) Tool pneumatic pipes Disput 8 points Output 8 points, eight spare wires From 6 × 2 Supply pressure MPa Disput 8 points Output 8 points, eight spare wires O 5 ± 1 0 % Protection specification Note5) I P 3 0	Ambient temperature °C		°C		0 ~	40			
Tool wiring Note4) Tool pneumatic pipes Tool pneumatic pipes Display pressure MPa Display Protection specification Note5) Input 8 points/Output 8 points, eight spare wires Display 6 × 2 Supply pressure MPa Display 5 ± 1 0 % I P 3 0			kg	4 7	4 8	5 0	5 1		
Tool pneumatic pipes Φ 6 × 2 Supply pressure MPa 0. 5 ± 1 0 % Protection specification Note5) I P 3 0	Tool wiring Note4)]	Input 8 points/Output 8	points, eight spare wires	}		
Supply pressure MPa 0.5±10% Protection specification Note5) I P 3 0									
			MPa		0.5:	± 10%			
	Protection specification	lote5)							
	Painting color			Lig	ght gray (Equivalent to	Munsell : 0.08GY7.46/0.8	1)		

Note1) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are composed.

Note2) Values of the operation below at rated load capacity.

• The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



Note3) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".

Note4) The pneumatic hand interface (option) is required when the tool (hand) output is used.

Note5) The protection specification details are given in Page 35, "2.2.8 Protection specifications". When using the robot in the oil mist environment etc., please choose oil mist specification (Table 2-10).

Table 2-9: Tab Standard specifications of robot (Clean Specification)

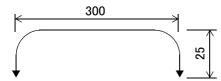
Item		Unit	t Specifications				
Type ^{Note1)}			RH-20SDH8530C	RH-20SDH8538C	RH-20SDH10030C	RH-20SDH10038C	
Environment			Clean specification				
Installation posture			On floor				
Degree of freedom				4	4		
Structure		ĺ		Horizontal, mul	tiple-joint type		
Drive system				AC serv	o motor		
Position detection method	od			Absolute	encoder		
Motor capacity	J1	W		7 5	5 0		
	J2	W		4 (0 0		
	J3 (Z)	W		4 (0 0		
	J4 (<i>θ</i> axis)	W		1 (0 0		
Brake				J1, J2 : no brake	J3, J4 : with brake		
Arm length	No. 1 arm	mm	5 2	2 5	5	2 5	
	No. 2 arm	mm	3 2	2 5	4	7 5	
Max.reach radius(No. 1+ I	No. 2)	mm	8 5	5 0	1 0	0 0	
Operating range	J1	deg		280 (± 140)		
	J2	deg		306 (± 153)		
	J3 (Z)	mm	300(-10 ~ 290) 380(-110 ~ 270)		300(-10 ~ 290)	380(-110 ~ 270)	
	J4 (θ axis)	deg	7 2 0 (± 3 6 0)				
Speed of motion	J1	deg/s	2 8 8				
	J2	deg/s	4 1 2 . 5				
	J3 (Z)	mm/s	1, 200				
	J4 (<i>θ</i> axis)	deg/s		1, 5	5 0 0		
Maximum horizontal com Note2)	posite speed	mm/s	11, 221	(6, 612)	13, 055	(8, 446)	
Cycle time ^{Note3)}		sec	0.	5 3	0.	6 9	
Link	Rating	kg		Ę	5		
Load	Maximum	(N)		2	0		
Allowable	Rating	. 2		0.	0 2		
inertia	Maximum	kg·m²		0.	2		
Pose repeatability Note4)	X-Y direc-		± 0.	0 2 5	± 0. 030		
	tion	mm			± 0.	030	
	J3 (Z)	mm		± 0.	0 1		
	J4 (<i>θ</i> axis)	deg		± 0.	0 3		
Ambient temperature °C		°C		0~	4 0		
Mass kg		kg	4 7	4 8	5 0	5 1	
Tool wiring Note5)				Input 8 points/Output 8		3	
Tool pneumatic pipes				Ф 6	× 2		
Supply pressure		MPa		0. 5 =	± 10%		
Degree of cleanliness ^{Not}	e6)		1 O (0.3 μ m)				
Painting color			Li	ght gray(Equivalent to I	Munsell : 0.08GY7.46/0.8	1)	

Note1) The type in which operating range of J3 axis (Z) is 300mm and 380mm is shown together.

Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are

Note3) Values of the operation below at rated load capacity.

· The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".

Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.

Note6) The details of the clean specifications are described in Page 38, "2.2.9 Clean specifications" To secure cleanliness, a clean room down flow of 0.3 m/s or more and an internal robot suction of 60 NL/min are required. A coupling of ϕ 8 is provided in the rear of the base for suction.

Table 2-10: Tab Standard specifications of robot (Oil mist Specification)

Item		Unit	Specifications				
Type ^{Note1)}			RH-20SDH8530M	RH-20SDH8538M	RH-20SDH10030M	RH-20SDH10038M	
Environment			Oil mist specification				
Installation posture				On	floor		
Degree of freedom			4				
Structure			Horizontal, multiple-joint type				
Drive system		Ì	AC servo motor				
Position detection method	od			Absolute	e encoder		
Motor capacity	J1	W		7	5 0		
	J2	W		4	0 0		
	J3 (Z)	W		4	0 0		
	J4 (<i>θ</i> axis)	W		1 (0 0		
Brake				J1, J2 : no brake	J3, J4 : with brake		
Arm length	No. 1 arm	mm	5 2	2 5	5 :	2 5	
	No. 2 arm	mm	3 2	2 5	4	7 5	
Max.reach radius(No. 1+ I	No. 2)	mm	8.5	5 0	1 0	0 0	
Operating range	J1	deg		280 (± 140)		
	J2	deg	306 (± 153)				
	J3 (Z)	mm	300(-10 ~ 290) 380(-110 ~ 270) 300(-10 ~ 290) 380(380(-110 ~ 270)		
	J4 (<i>θ</i> axis)	deg	7 2 0 (± 3 6 0)				
Speed of motion	J1	deg/s	2 8 8				
,	J2	deg/s	4 1 2 . 5				
	J3 (Z)	mm/s	1, 200				
	J4 (θ axis)	deg/s		1,	500		
Maximum horizontal com Note2)	posite speed	mm/s	11, 221	(6, 612)	13, 055	(8, 446)	
Cycle time ^{Note3)}		sec	0.	5 3	0.	6 9	
	Rating	kg			5		
Load	Maximum	(N)		2	0		
Allowable	Rating	kg·m²		0.	0 2		
inertia	Maximum	kg·m⁻		0.	2		
Pose repeatability Note4)	X-Y direc-	mm	± 0.	0 2 5	± 0.	030	
	tion	111111			± 0.		
	J3 (Z)	mm		± 0.	. 01		
	J4 (<i>θ</i> axis)	deg		± 0.	0 3		
Ambient temperature °C		°C		0~	4 0		
Mass		kg	4 7	4 8	5 0	5 1	
Tool wiring Note5)			Input 8 point	ts/Output 8 points, eigh			
Tool pneumatic pipes			Ф 6 × 2				
Supply pressure		MPa			± 10%		
Protection specification ¹	Note6) Note7)		I P 5 4				
Painting color			Liį	ght gray(Equivalent to	Munsell : 0.08GY7.46/0.8	1)	

Note1) The type in which operating range of J3 axis (Z) is 300mm and 380mm is shown together.

Note2) The value when J1, J2 and J4 are composed. The value in "<>" is the value when J1 and J2 are

Note3) Values of the operation below at rated load capacity.

· The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".

Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.

Note6) The protection specification details are given in Page 35, "2.2.8 Protection specifications".

Note7) When using the controller in an oil mist environment, etc., select the oil mist compatible controller specifications (indicated with "-SM" on type). The CR3-535M controller, compatible with an oil mist environment, is available as factory-shipped special specifications.

(5) RH-3SDHR series

Table 2-11: Tab Standard specifications of robot

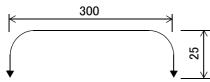
Item		Unit	Specifications Note1)		
Туре			RH-3SDHR3515	RH-3SDHR3512C	RH-3SDHR3512W
Environment			Standard specification	Clean specification	Waterproof specification
Installation posture			Hanging		
Degree of freedom			4		
Structure			Horizontal, multiple-joint type		
Drive system			AC servo motor		
Position detection method			Absolute encoder		
Motor capacity	J1	W	7 5 0		
	J2	W	200		
	J3 (Z)	W	200		
	J4 (<i>θ</i> axis)	W	100		
Brake			J1, J2, J4: no brake J3: with brake		
Arm length	No. 1 arm	mm	1 7 5		
	No. 2 arm	mm	1 7 5		
Max.reach radius(No. 1+ N	lo. 2)	mm	3 5 0		
Operating range	J1	deg	± 2 2 5		
Operating range	J2	deg	± 2 2 5		
	J3 (Z)	mm	1 5 0		2 0
	J4 (θ axis)	deg		± 7 2 0	
Speed of motion	J1	deg/s	672		
Speed of motion	J2	deg/s	7 0 8		
	J3 (Z)	mm/s	1, 500		
	J4 (θ axis)	deg/s	3, 146		
Maximum horizontal composite speed Note2)		mm/s	6, 267		
Cycle time ^{Note3)}		sec	0. 32		
Oyole time	Rating		1		
Load	Maximum	kg (N)	3		
Allowable	Rating		0. 005		
inertia	Maximum	kg·m²		0. 05 ± 0. 01	
Pose repeatability Note4)	X-Y direc-				
1 000 ropoutubility	tion	mm		_ 0. 0.	
	J3 (Z)	mm	± 0. 01		
	J4 (θ axis)	deg	± 0. 01		
Ambient temperature		°C	0~40		
Mass		kg	2 4 2 8		
Tool wiring Note5)		.,6	Input 8 points/Output 8 points (Option: Output 8 points), eight spare wires		
Tool pneumatic pipes		t 1	Primary: ϕ 6 x 2 (secondary: ϕ 4 x 8 by option)		
Supply pressure		MPa	0. 5 ± 1 0 %		
Protection specification			General-purpose environment: I P 2 0	Clean: ISO class 5	Waterproof: I P 6 5
Dainting color	Painting color		Not painting. Plating (silver)		

Note1) The table is joint writing on the General environment and clean and waterproof (IP65) specification.

Note2) The speed regulation function will operate at moving near the singular point by linear interpolation. Although based on specified speed, speed drops generally. Refer to Page 33, "2.2.6 About moving speed at singular point and near singular point. (RH-3SDHR series)" for details.

Note3) Values of the operation below at rated load capacity.

· The cycle time may increase when the positioning accuracy or other criterion of a work is required, or depending on the position of operation.



- ·The robot's moving time is influenced by the posture etc. As reference, the reduction method of cycle time is shown in Page 31, "[Supplementary explanation 2]: The setting which shortens execution time".
- Note4) The pose repeatability details are given in Page 24, "2.2.1 Pose repeatability".
- Note5) The pneumatic hand interface (option) is required when the tool (hand) output is used.

2.1.1 The counter-force applied to the installation surface

The counter-force applied to the installation surface for the strength design of the robot installation surface is shown.

Table 2-12: Value of each counter-force

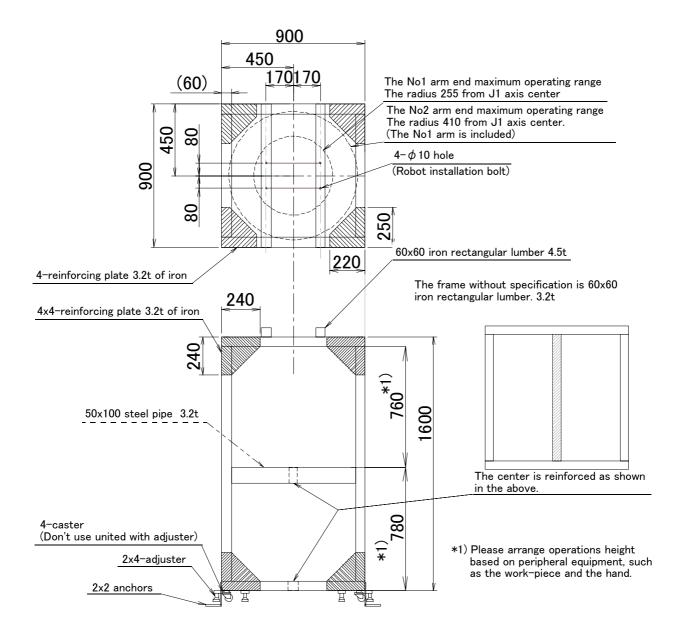
Item	Unit	Value				
RH-6SDH series						
Falls moment: M _L	N•m	380				
Torsion moment: M _T	N•m	4 1 0				
Horizontal translation force: F _H	N	920				
Vertical translation force: F _V	N	5 7 0				
RH-12SDH/18SDH/20SDH series						
Falls moment: M _L	N•m	1,310				
Torsion moment: M _T	N•m	1,440				
Horizontal translation force: F _H	N	1,900				
Vertical translation force: F _V	N	1,280				
RH-3SDHR series						
Falls moment: M _L	N•m	3,80				
Torsion moment: M _T	N•m	4 1 0				
Horizontal translation force: F _H	N	920				
Vertical translation force: F _V	N	5 7 0				

2.1.2 RH-3SDHR series installation stage

RH-3SDHR series is the robot which hangs. Please manufacture the stage by the customer as shown below, and install the robot.

As an example of the installation stage, the stage using the iron (cheap) and the stage using the aluminum (easy to process) are shown. Since the product made from the aluminum has strengthened reinforcement, both have the almost same weight.

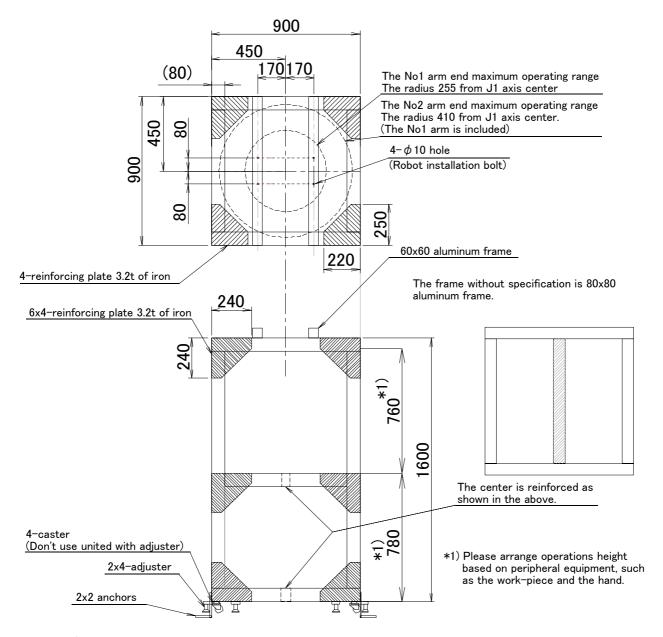
(1) Example which uses the iron material



- Note1) The gross weight of this stage is about 200kg.
- Note2) This stage is an example. Please design based on the conditions of the system.
- Note3) Fixing the stage to the floor by anchor etc. If the center of gravity of the stage is in the high position, the stage may fall by movement of the robot.

Fig.2-1: Installation stage (Example of iron-material use)

(2) Example which uses the aluminum



- Note1) The gross weight of this stage is about 200kg.
- Note2) This stage is an example. Please design based on the conditions of the system.
- Note3) Fixing the stage to the floor by anchor etc. If the center of gravity of the stage is in the high position, the stage may fall by movement of the robot.

Fig.2-2: Installation stage (Example of aluminum frame use)

2.2 Definition of specifications

The accuracy of pose repeatability mentioned in catalogs and in the specification manual is defined as follows.

2.2.1 Pose repeatability

For this robot, the pose repeatability is given in accordance with JIS 8432 (Pose repeatability). Note that the value is based on 100 measurements (although 30 measurements are required according to JIS).

[Caution] The specified "pose repeatability" is not guaranteed to be satisfied under the following conditions.

- [1] Operation pattern factors
 - 1) When an operation that approaches from different directions and orientations are included in relation to the teaching position during repeated operations
 - 2) When the speed at teaching and the speed at execution are different
- [2] Load fluctuation factor
 - 1) When work is present/absent in repeated operations
- [3] Disturbance factor during operation
 - 1) Even if approaching from the same direction and orientation to the teaching position, when the power is turned OFF or a stop operation is performed halfway
- [4] Temperature factors
 - 1) When the operating environment temperature changes
 - 2) When accuracy is required before and after a warm-up operation
- [5] Factors due to differences in accuracy definition
 - 1) When accuracy is required between a position set by a numeric value in the robot's internal coordinate system and a position within the actual space
 - 2) When accuracy is required between a position generated by the pallet function *1) and a position within the actual space
- [6] Positioning movement near the singular point (RH-3SDHR series)

^{*1)}

The pallet function is a function that teaches only the position of the work used as reference (3 to 4 points) and obtains the remaining positions by calculations, for an operation that arranges works orderly or for an operation that unloads orderly arranged works. By using this function, for example, in the case of an operation that arranges works on grid points of 100 x 100, by teaching only three points of four corners, the remaining grid points are automatically generated; thus, it is not necessary to teach all 10,000 points. For more information about the pallet function, refer to the separate volume, "Instruction Manual/Detailed Explanation of Functions and Operations."

2.2.2 Rated load (mass capacity)

The robot's mass capacity is expressed solely in terms of mass, but even for tools and works of similar mass, eccentric loads will have some restrictions When designing the tooling or when selecting a robot, consider the following issues.

- (1) The tooling should have the value less or equal than the smaller of the tolerable inertia and the tolerable moment found in Page 10, "2.1 Standard specifications".
- (2) Fig. 2-3, Fig. 2-4, Fig. 2-5, Fig. 2-6 and Fig. 2-7 shows the distribution dimensions for the center of gravity in the case where the volume of the load is relatively small. Use this figure as a reference when designing the tooling.
- [CAUTION] The mass capacity and the allowable moment of inertia are significantly affected by the operating speed and operating posture of the robot. Even when these values are within the allowable range described above, an overload or overcurrent alarm may occur. In such cases, the acceleration/deceleration time settings, operating speed and/or operating posture must be adjusted.
- [CAUTION] The overhang amount of the load, such as the mass capacity and the allowable moment of inertia defined in this section, are dynamic limit values determined by the capacity of the motor that drives axes or the capacity of the speed reducer. Therefore, it does not guarantee the accuracy on all areas of tooling. Guaranteed accuracy is measured from the center point of the mechanical interface surface. Please note that if the point of operation is kept away from the mechanical interface surface by long and low-rigid tooling, the positioning accuracy may deteriorate or may cause vibration.
 - Note that the allowable offset value (Z direction) from the lower edge of the shaft to the position of center of gravity is 100 mm.
- [Caution] Even within the allowable range previously mentioned, an overload alarm may be generated if an ascending operation continues at a micro-low speed. In such a case, it is necessary to increase the ascending speed.

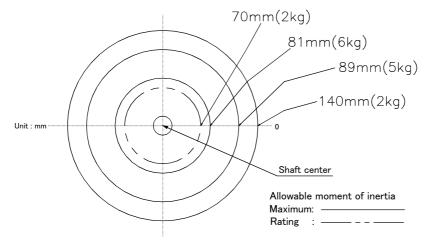


Fig.2-3: Position of center of gravity for loads (for loads with comparatively small volume): RH-6SDH series

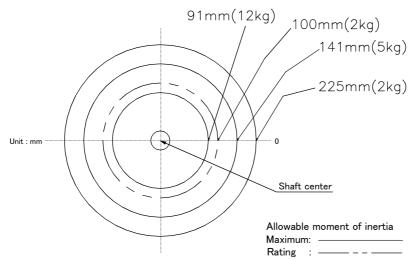


Fig.2-4: Position of center of gravity for loads (for loads with comparatively small volume): RH-12SDH series

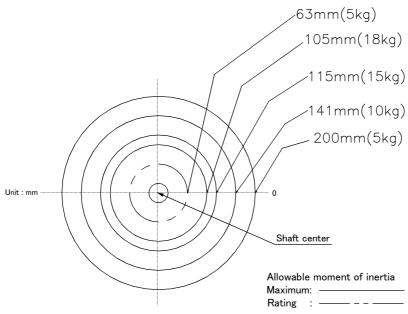


Fig.2-5: Position of center of gravity for loads (for loads with comparatively small volume): RH-18SDH series

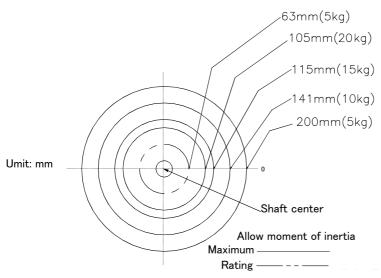


Fig.2-6: Position of center of gravity for loads (for loads with comparatively small volume): RH-20SDH series

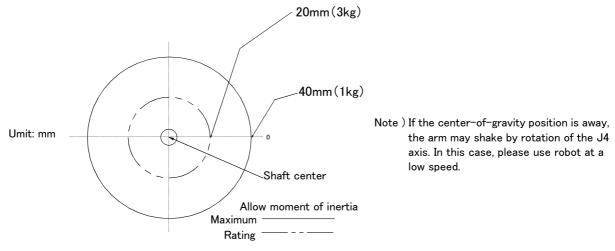


Fig.2-7: Position of center of gravity for loads (for loads with comparatively small volume): RH-3SDHR series

2.2.3 Relationships Among Mass Capacity, Speed, and Acceleration/Deceleration Speed

This robot automatically sets the optimum acceleration and deceleration speeds and maximum speed, according to the load capacity and size that have been set, and operates using these automatically set speeds.

To achieve that, it is necessary to correctly set the actual load data (mass and size of hand and work) to be used. However, vibration, overheating and errors such as excessive margin of error and overload may occur, depending on the robot operation pattern or ambient temperature. In such a case, change the setting value to the +20% range. If a setting is performed in such a way that it falls below the mounted load, the life span of the mechanism elements used in the robot may be shortened. In the case of a work requiring a high degree of accuracy, set up the load correctly and use the robot by lowering the ratios of the acceleration and deceleration speeds.

(1) Setting Load Capacity and Size (Hand Conditions)

Set up the capacity and size of the hand with the "HNDDAT*" parameter (optimum acceleration/deceleration setting parameter), and set up the capacity and size of the work with the "WRKDAT*" parameter. Numbers 0 to 8 can be used for the asterisk (*) part. Designate the "HNDDAT*" and "WRKDAT*" parameters to be used using the "LOADSET" command in a program.

For more details, refer to the separate "Instruction Manual/Detailed Explanation of Functions and Operations." It is the same meaning as "LOADSET 0.0" if not using the "LOADSET".

<Factor default settings>

	Hand mass	size X	size Y	size Z	center-of-gravity	center-of-gravity	center-of-gravity
	kg	mm	mm	mm	position X mm	position Y mm	position Z mm
RH-6SDH ser	ies						
HNDDAT*	6.0	99.0	99.0	76.0	0.0	0.0	38.0
WRKDAT*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RH-12SDH se	ries						
HNDDAT*	12.0	225.0	225.0	30.0	0.0	0.0	15.0
WRKDAT*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RH-18SDH se	ries						
HNDDAT*	18.0	258.0	258.0	34.0	0.0	0.0	17.0
WRKDAT*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RH-20SDH se	ries						
HNDDAT*	20.0	258.0	258.0	38.0	0.0	0.0	19.0
WRKDAT*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RH-3SDHR se	eries						
HNDDAT*	3.0	76.0	76.0	58.0	0.0	0.0	24.0
WRKDAT*	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2.2.4 Vibrations at the Tip of the Arm during Low-Speed Operation of the Robot

Vibrations at the tip of the arm may increase substantially during the low-speed operation of the robot, depending on the combination of robot operation, hand mass and hand inertia. This problem occurs when the vibration count specific to the robot arm and the vibration count of the arm driving force are coming close to each other. These vibrations at the tip of the arm can be reduced by taking the following measures:

- 1) Lower the robot's operating speed by approximately 5% from high speed using the Ovrd instruction.
- 2) Change and move the teaching points of the robot.
- 3) Change the hand mass and hand inertia.

2.2.5 Vibration of shaft (J3 axis) position and arm end

Vibrations at the tip of the arm may increase substantially during operation under the shaft position near the low end or the high end of the robot, depending on the combination of hand mass and hand inertia. This problem occurs according to that inertia, because the distance from the shaft support section to the shaft end becomes long. When this vibration affects the robot's operations, please change operating speed etc. like the above "2.2.4 Vibrations at the Tip of the Arm during Low-Speed Operation of the Robot."

(1) Relationship Between Mass Capacity and Speed

A function to optimize the maximum speed of each axis according to the setting value of the load capacity will be activated (Refer to Fig. 2-8). However, this function does not work with the setting of 2kg (5kg in the case of RH-18SDH/RH-20SDH sereis) or lighter load mass. When the setting of the load mass is changed to 2kg (5kg in the case of RH-18SDH/RH-20SDH sereis) or heavier, the maximum speed is compensated according to the load mass.

[CAUTION] Depending on the operation pattern, the speed and/or acceleration/deceleration at the front edge may not be parallel with the speed and the rate of change of acceleration/deceleration specified in a program.

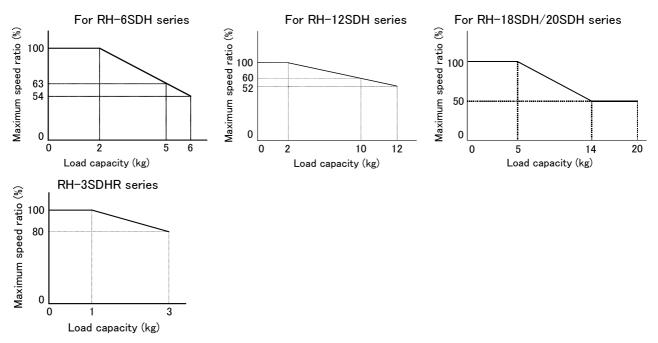


Fig.2-8: Automatic compensation of speed

(2) Relationship Between Height of Shaft (J3 Axis) and Acceleration/Deceleration Speed A function to optimize the acceleration/deceleration speed according to the height of the shaft (Refer to Fig. 2-9) will be activated. This function is invalid if the shaft (axis J3) operates at a position above P3 in Fig. 2-9. Acceleration/deceleration is compensated for at a position below P3 in Fig. 2-9 if the position of the center of gravity of the load is located at the front edge of the shaft.

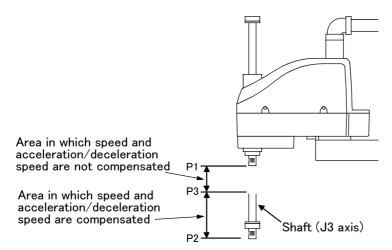


Fig.2-9: Area in which acceleration/deceleration speed is compensated

Table 2-13: Area in which acceleration/deceleration speed is compensated

	J3	axis stroke(m	Compensation area	
Туре	Stroke length	P1(Upper end)	P2(Lower end)	(P2 to P3)
RH-6SDH series	200	297	97	97 ~ 247
	320	297	-23	−23 ~ 247
RH-12SDH series	350	340	-10	−10 ~ 248
	450	340	-110	−110 ~ 248
RH-18SDH series	350	340	-10	−10 ~ 320
RH-20SDH series	450	340	-110	−110 ~ 320
RH-3SDHR series	150	-583	-733	-733 ~ -643

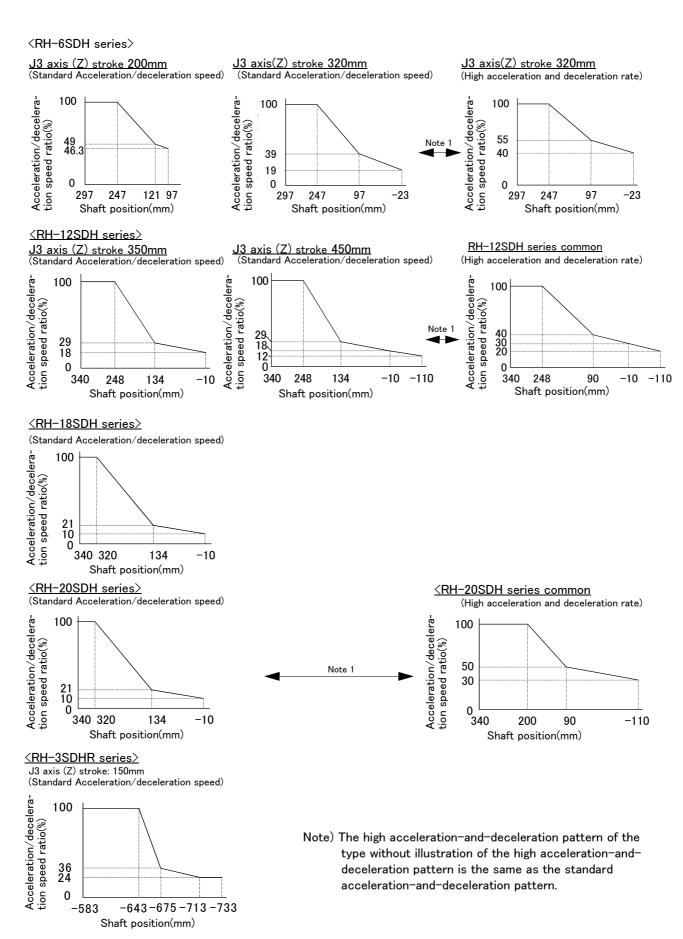


Fig.2-10: Automatic compensation of acceleration/deceleration speed

[Supplementary explanation 1]: Acceleration-and-deceleration pattern selection

*To the customer who uses RH-6SDH/12SDH/20SDH series (Note 1 of Fig. 2-10)

In RH-6SDH/12SDH / 20SDH series, the standard acceleration-and-deceleration rate and the high acceleration-and-deceleration rate are prepared for the acceleration-and-deceleration optimization function corresponding to the height of the shaft (J3 axis), and it can be chosen by the parameter. Initial setting is the standard acceleration-and-deceleration rate, and vibration (remains vibration to include) is suppressed to the minimum. When this vibration does not affect the robot's operations, the high acceleration-and-deceleration rate can be chosen, and the robot can be operated at high speed. Please change the parameter if needed and utilize the robot.

The target parameter name and the setting value are shown below. Refer to "separate instructions manual/Detailed explanations of functions and operations" for the details of the parameter and change method.

Parameter name: MAPMODE

The setting value and the function.....0: Standard acceleration-and-deceleration rate (initial value),

1: High acceleration-and-deceleration rate

*To the customer who uses RH-18SDH85xx series

When work mass including the hand is used in RH-20S<u>D</u>H85xx series on the conditions of 18kg or less as usual, cycle time may differ from the conventional. In this case, the robot can be operated in cycle time almost equivalent to the conventional RH-18SDH85xx series by changing the value of parameter: LOADMODE into "1". Please change the parameter if needed and utilize the robot.

The target parameter name and the setting value are shown below. Refer to "separate instructions manual/Detailed explanations of functions and operations" for the details of the parameter and change method.

Parameter name: LOADMODE

Setting value and function......0: 20kg mode (initial value), 1: 18kg mode

*To the customer who uses RH-3SDHR series

The RH-3SDHR series have standard acceleration-and-deceleration mode only.

[Supplementary explanation 2]: The setting which shortens execution time

The execution time can be improved by using the following methods.

- 1) Perform continuous path operation using the Cnt instruction.
- 2) Control the optimum acceleration/deceleration using the Oadl instruction.
- 3) Control the optimum speed using the Spd instruction.
- 4) Setting a larger value in the optimum acceleration/deceleration adjustment rate parameter (JADL). (RH-3SDHR series)

The moving time can be shortened by setting a larger value in the optimum acceleration/deceleration adjustment rate parameter (JADL). In the RH-3SDHR series, the acceleration/deceleration speed is initialized to allow continuous moving with a short wait time (setting of B in the figure).

This setting is suited for continuous operations that have a short tact time, such as palletizing work.

Conversely, if quick moves (short moving time) are required, such as L/UL work on machined parts, the acceleration/deceleration speed can be increased by initial setting (setting of A in the Fig. 2-11).

However, depending on the set values of acceleration/deceleration speed, it becomes easy to cause an overload error and an overheat error. Moreover, excessive error may occur depending on an installation environment.

In such a case, extend the wait time, reduce the acceleration/deceleration speed, or decrease the moving speed.

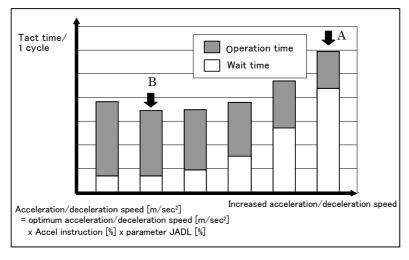


Fig.2-11: Relationship between Acceleration/deceleration Speed and Tact Time (Conceptual Drawing)

5) Move without changing the posture. (RH-3SDHR series)
The robot's moving time is influenced not only by the size of moving distance but by posture change.
The example is shown in Fig. 2-12. When moving changing the posture (left side of the figure), the movement distance is shorter, but moving time may become long conversely. Conversely, When moving without changing the posture, moving

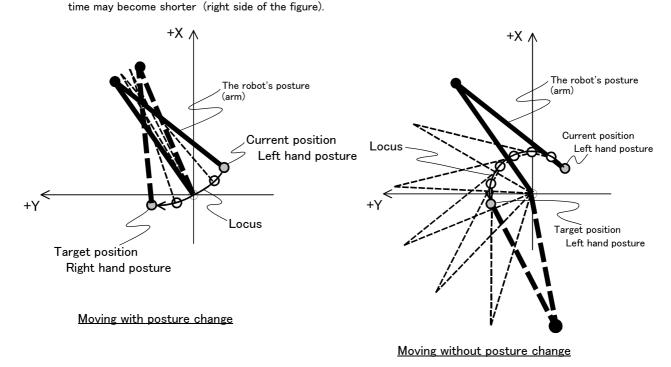


Fig.2-12: Moving time by posture change (Conceptual Drawing)

- (3) Time to reach the position repeatability (only for RH-12SDH/18SDH/20SDH series)
 When using this robot, the time to reach the position repeatability may be prolonged due to the effect of residual vibration at the time of stopping. If this happens, take the following measures:
 - 1) Change the operation position of the Z axis to the location near the top as much as possible.
 - 2) Increase the operation speed prior to stopping.
 - 3) When positioning the work near the bottom edge of the Z axis, if no effectiveness is achieved in step $\langle 2 \rangle$ above, perform operation $\langle 1 \rangle$ (robot path: O \rightarrow A \rightarrow C). In the case of operation 2 (robot path: O \rightarrow B \rightarrow C), residual vibration may occur. (Refer to Fig. 2-13.)

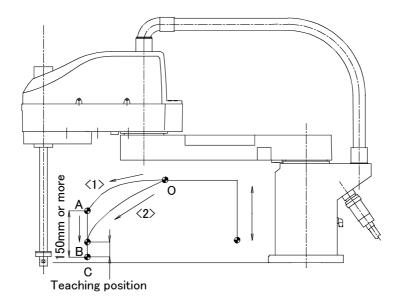


Fig.2-13: Recommended path when positioning at the bottom edge of the Z axis

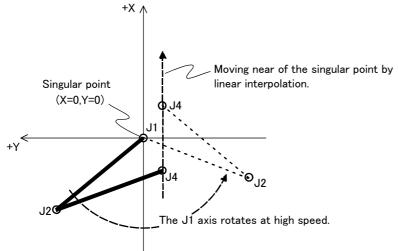
2.2.6 About moving speed at singular point and near singular point. (RH-3SDHR series)

The robot of our company has memorized the teaching position and calculates of linear interpolation movement using the position data in the XYZ coordinate system. Even if it is the same position data, the robot can take two or more postures.

For example, if X coordinate value is "0" and Y coordinate value is also "0", the rotation angle of J1 axis is not decided uniquely. This position is called singular point, and positioning or passing with XYZ JOG and linear interpolation will not be performed. And, even though based on the specified speed, when moving near singular point with linear interpolation, the error occurs, because the J1 axis must rotate at the big speed. ("a)" of Fig. 2–14) However, in RH–3SDHR series, speed was lowered automatically and it has the function which can be passed without the error.

In addition, this function can be changed valid/invalid by setting of parameter:SPDOPT, and SpdOpt command. Refer to the separate manual "Detailed explanations of functions and operations" for details. And, the area in R2 shown in "b)" of Fig. 2-14 is the singular point, and positioning and passage with linear

And, the area in R2 shown in b) of Fig. 2–14 is the singular point, and positioning and passage with linear interpolation movement cannot be performed. In joint interpolation movement, positioning and passage are possible. It is in valid condition at shipping.



a) The singular point and the movement near the singular point

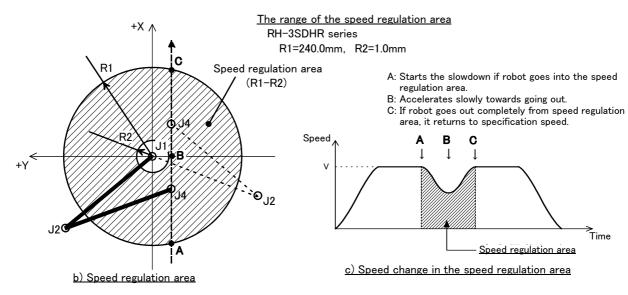


Fig.2-14: The singular point and the speed regulation near the singular point

2.2.7 Collision detection

Collision detection function is valid condition for both of automatic and jog operation at shipping in RH-3SDHR series. (Parameter: COL=1, 1, 1)

So, the robot stops immediately if the robot's tool or arm interferes with a peripheral device, minimizing damage. Therefore, please use in the valid condition.

The abnormalities are detected by the robot's kinetics model, presuming torque necessary for movement at any time. Therefore, the setting parameter (HNDDAT*, WRKDAT*) of the hand and the work piece conditions should be right. And, it may be detected as the collision in movement as speed and motor torque are changed rapidly. (for example, the movement near the place of the origin by linear interpolation, the reversal movement, the cold condition, the operation after long term stoppage)

In such a case, by adjusting the value of the setting parameter (COLLVL, COLLVLJG) of the collision detection level according to actual use environment, the sensitivity of collision detection can be optimized and the damage risk can be reduced further.

And, in the operation after the low temperature or long term stoppage, please operate by accustoming at low speed (warm-up), or use the warm-up operation mode.

Refer to the separate instruction manual "Detailed explanations of functions and operations" for details of related parameter.

Table 2-14: Factory-shipments condition

	JOG operation	Automatic
RH- ☐ SDH series	Valid	Invalid
RH-3SDHR series	Valid	Valid

2.2.8 Protection specifications

(1) Types of protection specifications

The robot arm has protection specifications that comply with the IEC Standards. The protection specifications and applicable fields are shown in Table 2-15.

Even oil mist environment can be used in addition to the general environment.

Table 2-15: Protection specifications and applicable fields

	Туре	Protection specifications (IEC Standards value)	Classification	Applicable field	Remarks		
F	RH-6SDH series						
	RH-6SDH xx20/xx32	Robot arm : IP20	General environ- ment specifications	General assembly Slightly dusty environment			
		Robot arm:IP54 Robot arm:IP54	tions	Machine shop with heavy oil mist Dusty work shop	Note that if the cutting machine contains abrasive materials, the robot machine line will be shortened.		
F	RH-12SDH series						
	RH-12SDHxx35/xx45	Robot arm : IP20	General environ- ment specifications	General assembly Slightly dusty environment			
	RH-12SDHxx30M/xx38M RH-12SDHxx30M-SM/ xx38M-SM ^{Note2)}		· ·	Machine shop with heavy oil mist Dusty work shop	Note that if the cutting machine contains abrasive materials, the robot machine line will be shortened.		
F	RH-18SDH series	•					
	RH-18SDH 8535 ^{Note3)}	Robot arm : IP20	General environ- ment specifications	General assembly Slightly dusty environment			
			tions	Machine shop with heavy oil mist Dusty work shop	Note that if the cutting machine contains abrasive materials, the robot machine line will be shortened.		
F	RH-20SDH series		Į.				
	RH-20SDHxx35/xx45	Robot arm : IP20	General environ- ment specifications	General assembly Slightly dusty environment			
	RH-20SDHxx30M/xx38M RH-20SDHxx30M-SM/ xx38M-SM ^{Note4)}			Machine shop with heavy oil mist Dusty work shop	Note that if the cutting machine contains abrasive materials, the robot machine line will be shortened.		
F	RH-3SDHR series						
	RH-3SDHR3515	Robot arm:IP20	General environ- ment specifications	General assembly Slightly dusty environment			
	RH-3SDHR3512W	Robot arm : IP65	Waterproof specifi- cation	Food processing (handling) The field which requires the washing of the robot arm.			

Note1) The "-SM" specification (specification with the controller protection box) comes with the controller protection box (CR1D-MB) as standard.

Note4) Replaced with the CR3D-751M controller in the case of the "-SM" specification (controller specification with countermeasure against oil mist)



Use the controller protection box (CR1D-MB) to protect the controller from the environment when the CR1DA-700 series controller will be used in the environment such as the oil mist shown in the Table 2-15. A robot equipped with the controller protection box as standard is available. (Only for the controller of standard specification)

We are confirming examining with the cutting oil shown in Table 2–16, and satisfying protection specification. Our warranty does not cover damages or failure resulting from the robot being operated in any environment where other cutting oils than those listed in the table are used (except cutting oils with respect to which the robot's compatibility with the protection specification is verified through our operability evaluation) or where the robot body may be directly splashed with water, oil or dust in quantities greater than stated in the protection specification.

Note2) Replaced with the CR3D-741M controller in the case of the "-SM" specification (controller specification with countermeasure against

Note3) Replaced with the CR3D-751M controller in the case of the "-SM" specification (controller specification with countermeasure against oil mist)

Table 2-16: Cutting oil which examined as oil mist environment

No.	Name	Maker	Property	Operating condition
1	CastrolHysol X	Castrol Co., Ltd	Water-soluble	Diluted by a factor of 20
2	CastrolSyntilo9954	Castrol Co., Ltd	Water-soluble	Diluted by a factor of 20
3	Yushiron Oil	YUSHIRO CHEMICAL INDUSTRY CO., LTD	Water-insoluble	-
4	YushirokenE10	YUSHIRO CHEMICAL INDUSTRY CO., LTD	Water-soluble	Diluted by a factor of 20
5	Yushiroken synthetic 770TG	YUSHIRO CHEMICAL INDUSTRY CO., LTD	Water-soluble	Diluted by a factor of 20
6	YushirokenFX90	YUSHIRO CHEMICAL INDUSTRY CO., LTD	Water-soluble	Diluted by a factor of 20
7	SUNCUT ES-50N	NIPPON GREASE CO., LTD	Water-insoluble	-
8	Searching cut SG555	KYOUWA OIL LUBRICANTS CO., LTD,	Water-insoluble	_
9	EMULCUT FA-800	KYODO YUSHI CO., LTD	Water-soluble	-

[Information]

• The IEC IP20

It indicates the protective structure that prevents an iron ball 12 $^{+0.05}_{0}$ mm diameter, which is being pressed with the power of 3.1 kg \pm 10%, from going through the opening in the outer sheath of the supplied equipment.

• The IEC IP54

The IEC IP54 standard refers to protection structure designed to prevent any harmful effects by fresh water scattering vertically onto the testing equipment in a radius of 180 degrees from a distance of 300 to 500 mm, with 10 ± 0.5 liters of water every minute, at a water pressure of 80 to 100kPa, covering the entire area of the robot with the exception of the installation section at 1 m^2 per minute, for a total of 5 minutes or more.

• The IEC IP65

Protection against water infiltration as specified in IP65 indicates a protective structure that is not harmfully affected when $12.5 \pm 5\%$ liters of water is supplied from a test device at a position approx. 3m away in various directions and a water pressure of 30kPa at the nozzle section. The water is filled one minute per 1m^2 of test device surface area for a total of three minutes.

The IEC IP symbols define the degree of protection against solids and fluids, and do not indicate a protective structure against the entry of oil or water.

(2) About the use with the bad environment

The protection specifications robot has protection methods that conform to IEC's IP54 standards (splashproof type). It has protection structure designed to prevent harmful effects caused by splashing water coming from various directions, as the robot is operating.

Recommended usage conditions

- 1) The robot is designed for use in combination with machining device.
- 2) We are confirming examining with the cutting oil shown in Table 2-16, and satisfying protection specification. Our warranty does not cover damages or failure resulting from the robot being operated in any environment where other cutting oils than those listed in the table are used (except cutting oils with respect to which the robot's compatibility with the protection specification is verified through our operability evaluation) or where the robot body may be directly splashed with water, oil or dust in quantities larger than stated in the protection specification.
- 3) Take measures so that the robot will not be exposed to water, oil and/or chips for a long period of time.
- 4) Robot's protection performance can be improved by pressurizing its interior. If you use a robot in an environment where oil mist is present, it is recommended that the interior of the robot be pressurized to ensure its reliability over a long period of time. Please supply the dry air for pressurization from the phi-8 joint (AIR PURGE) of the robot-arm base rear.

Table 2-17: Specification of the dry air for pressurization

Item	Dew point	Pressure
Specification	The atmospheric pressure dew point is −20 degree or less.	0 to 0.3kPa

The packing gets deteriorated with the passage of time and must be replaced as required. Table 2–18 provides guidelines for replacing the packing.

Table 2-18: Packing replacement guideline

J	.'	
Environment	Whether or not robot is pressurized	When packing must be replaced
General environment	Not pressurized Note1)	
Clean room	Not pressurized Note1)	When signs of cracking or peeling are noted in the packing.
Oil mist	Pressurized	
	Not pressurized	When removing and installing the cover.

Note1) The pressurization inside the robot arm is unnecessary in general environment and clean room environment.

Failure to replace deteriorated packing permits water or oil to enter the interior of the robot, possibly causing it to become inoperable.

Table 2-43 lists packings requiring replacement and corresponding robot covers. Packing required and liquid gasket used therewith are available from dealer.

Also, entrained water droplets lead to the formation of rust on the robot, but would not usually affect the robot's ability to operate normally.

The warranty is invalid for any faults that occur when the robot is used under the following conditions.

Also, if the cover and/or other parts are damaged by interferences caused by the peripheral devices and the robot, the protection specification (seal performance, etc.) may be degraded. Therefore, please pay extra attention when handling the robot.

Refer to Page 221, "6.2 Working environment".

- 1) In surroundings that generate inflammable gases or corrosive gasses.
- 2) Atmosphere used excluding cutting oil shown in Table 2-16.
- 3) Environment where the robot is exposed to water, oil and/or chips for a long period of time.
- 4) In surroundings where chips fall directly on the robot. In surroundings where the minimum diameter of chips is less than 0.5 mm.
- 5) Mist atmosphere exceeding the specification.
- 6) Pressurization by the dry air exceeding the specification of Table 2-17

2.2.9 Clean specifications

(1) Types of clean specifications

The robot arm with clean specification is made by order. Please check the delivery schedule.

Table 2-19: Clean specifications

Туре	Degree of cleanliness	Internal suction	Remarks
RH-6SDHxx17C/xx27C RH-12SDHxx30C/xx38C RH-18SDH8530C RH-20SDHxx30C/xx38C	10(0.3 μ m)	Concentrated suction with vacuum generating valve. Use it in the clean room with the down flow (flow velocity 0.3 m/s	The use of a vacuum generating valve is recommended.
RH-3SDHR3512C	ISO class 5	above).	

■ Precautions for use

- 1) When using a device that moves or rotates the robot arm, the down flow may not be secured because of the air flow. In this case, the degree of cleanliness cannot be ensured.
- 2) A ϕ 8 coupling is provided in the base section of the robot arm for suction inside the robot arm. When using the robot, connect this coupling with the vacuum generating valve and vacuum pump (furnished by the customer).

[1] When the inside of the robot arm is sucked using the vacuum generator.

Table 2-20: Specifications of vacuum generation valve (Confirmed in our company)

Туре	Maker	Air pressure ^{Note1)}
MEDT 14	KONEGAI CORPORATION	 Vacuum rate (supply pressure is 0.5MPa): 96l. / min Ultimate vacuum (supply pressure is 0.5MPa): -84KPa

Note1) Install the vacuum generating valve downstream of the downflow or install a filter in the exhaust air section so that the exhaust air from the vacuum generating valve does not affect cleanness. Recommended filter: Exhaust filter EF300-02, Koganei Corporation

[2]If any vacuum pump is prepared by the customer, assure on the vacuum side flow rate 60 liters/min.(ANR) or more.

3) When using the Mitsubishi standard option solenoid valve set, use the spare piping (Φ 6 pneumatic hose) of the primary piping to exhaust the air.

If the exhaust leaks into the robot arm, the degree of cleanliness could be affected.

2.3 Names of each part of the robot

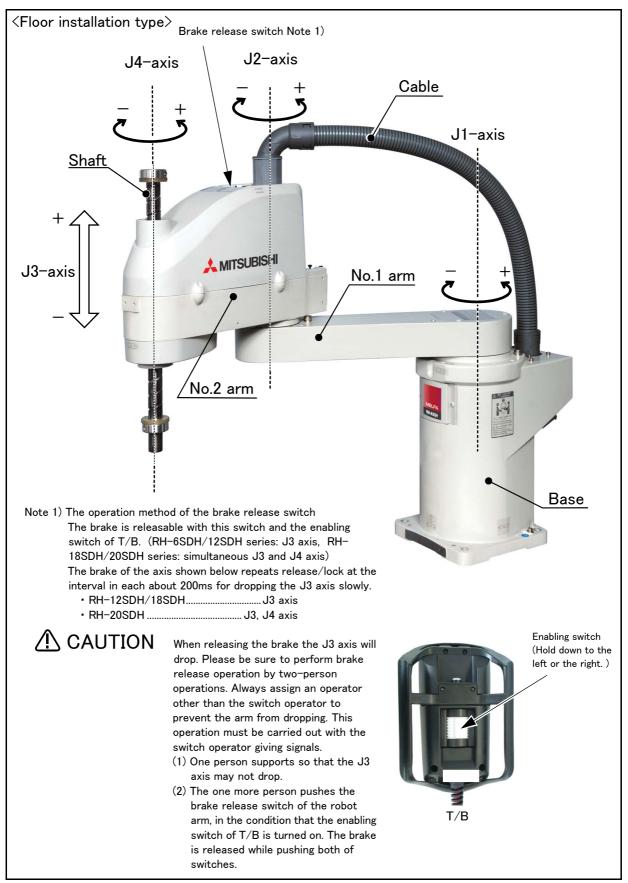


Fig.2-15: Names of each part of the robot (Floor installation type)

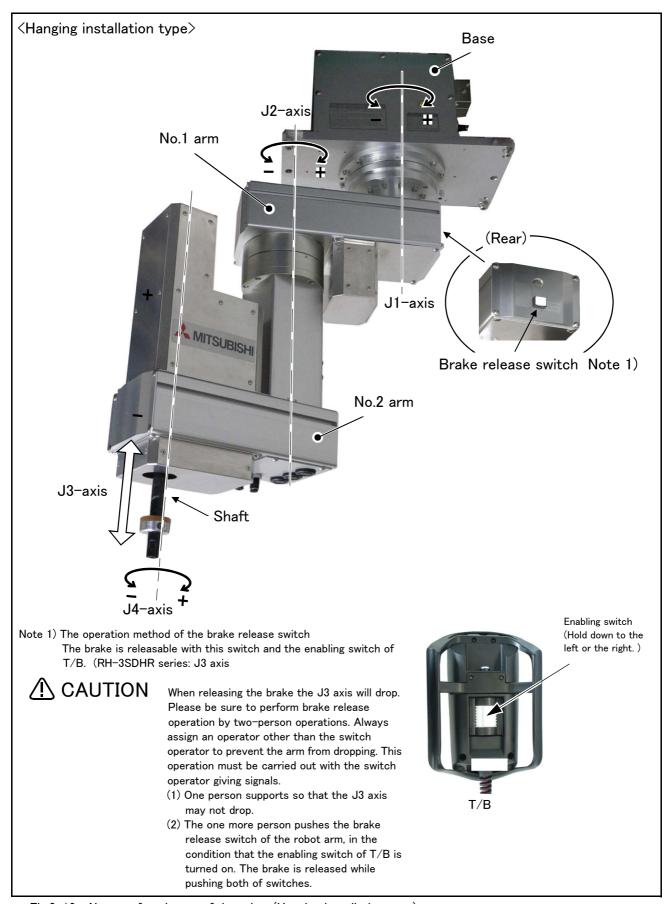


Fig.2-16: Names of each part of the robot (Hanging installation type)

- 2.4 Outside dimensions Operating range diagram
- 2.4.1 Outside dimensions Operating range diagram (RH-6SDH series)
- (1) Standard Specification

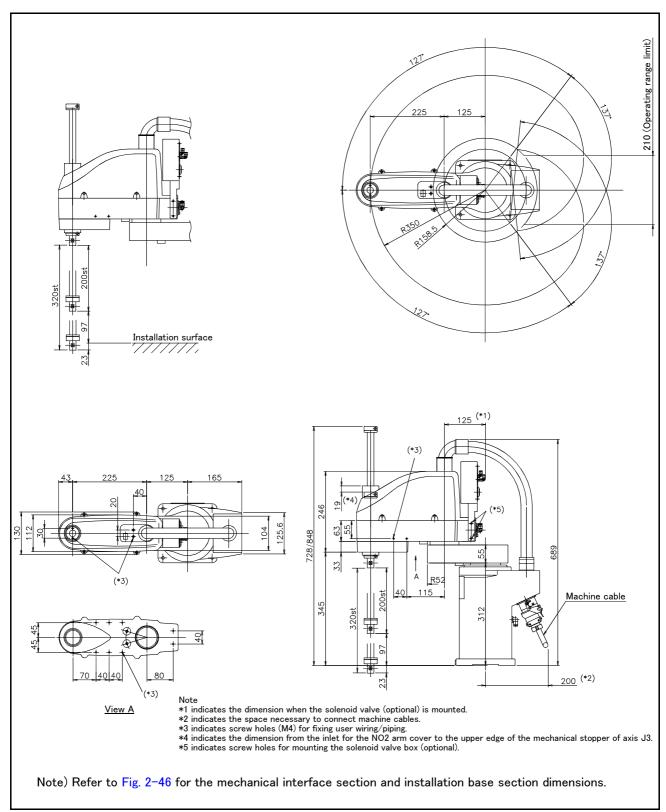


Fig.2-17: Outside dimensions, Operating range diagram of RH-6SDH35xx

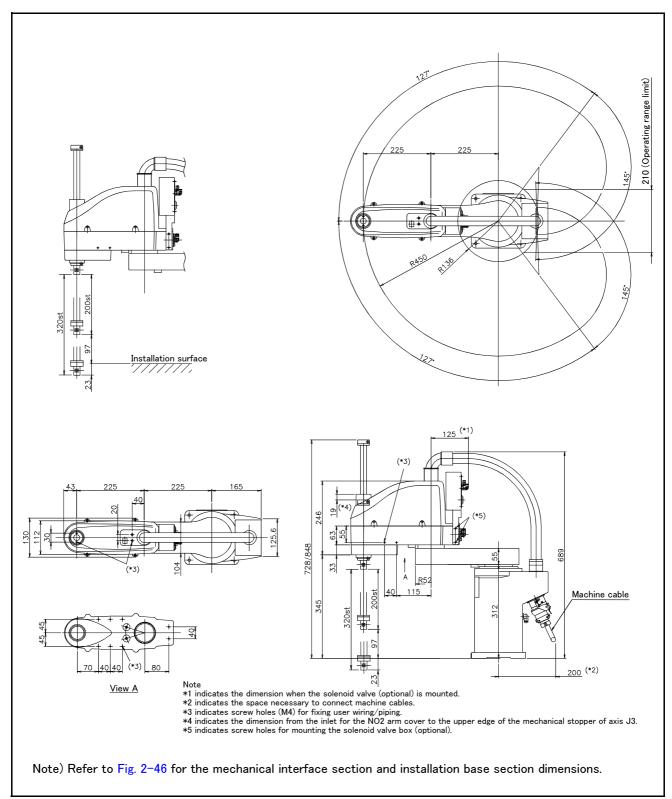


Fig.2-18: Outside dimensions, Operating range diagram of RH-6SDH45xx

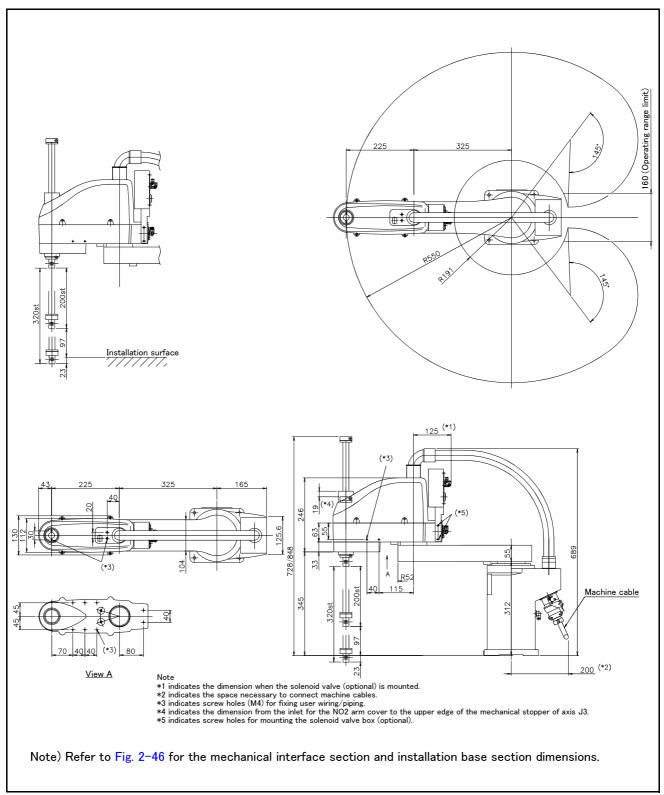


Fig.2-19: Outside dimensions, Operating range diagram of RH-6SDH55xx

(2) Clean Specification

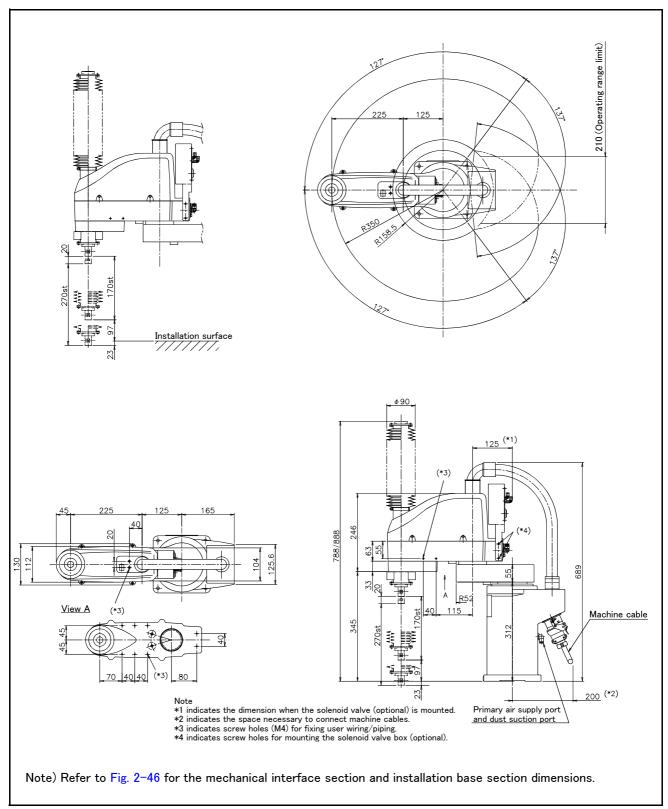


Fig.2-20: Outside dimensions, Operating range diagram of RH-6SDH35xxC

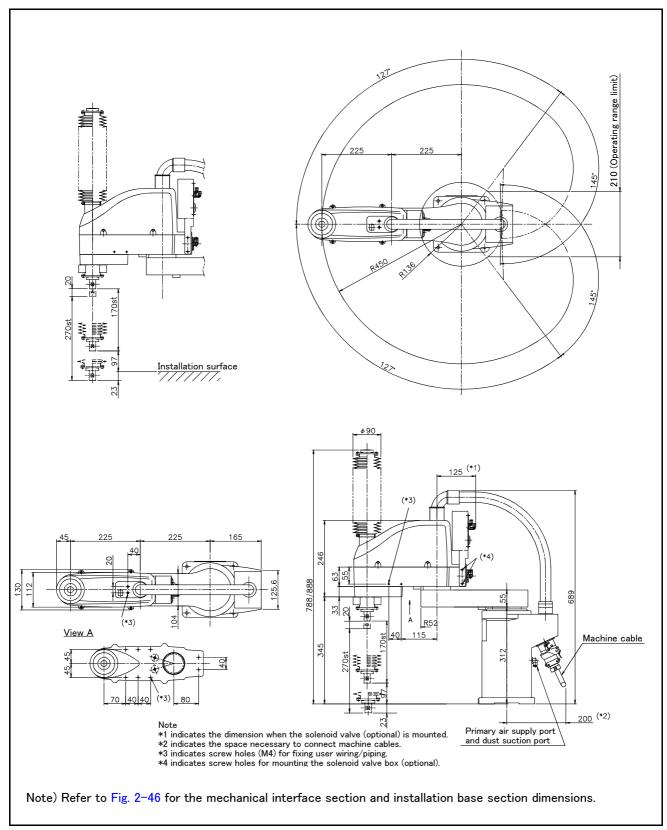


Fig.2-21: Outside dimensions, Operating range diagram of RH-6SDH45xxC

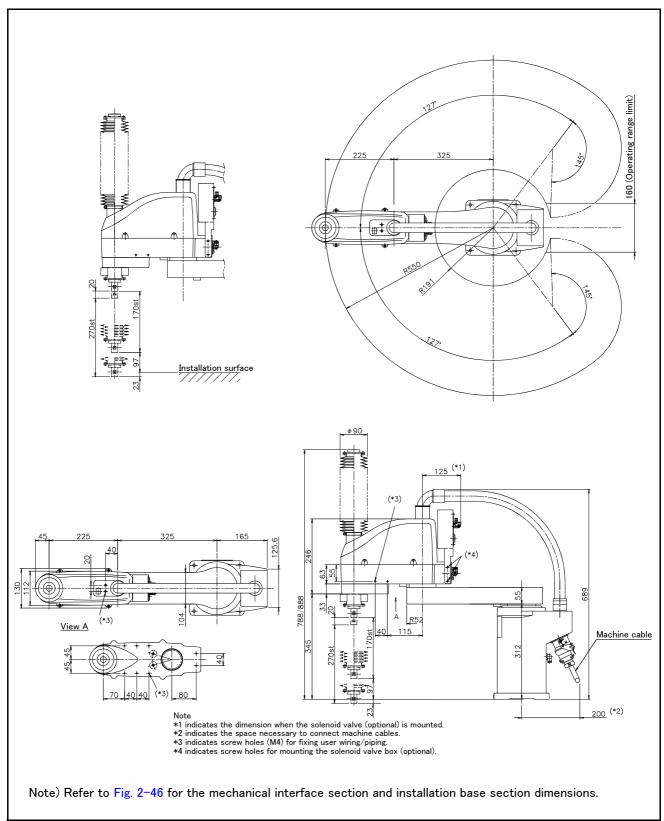


Fig.2-22 : Outside dimensions, Operating range diagram of RH-6SDH55xxC

(3) Oil mist Specification

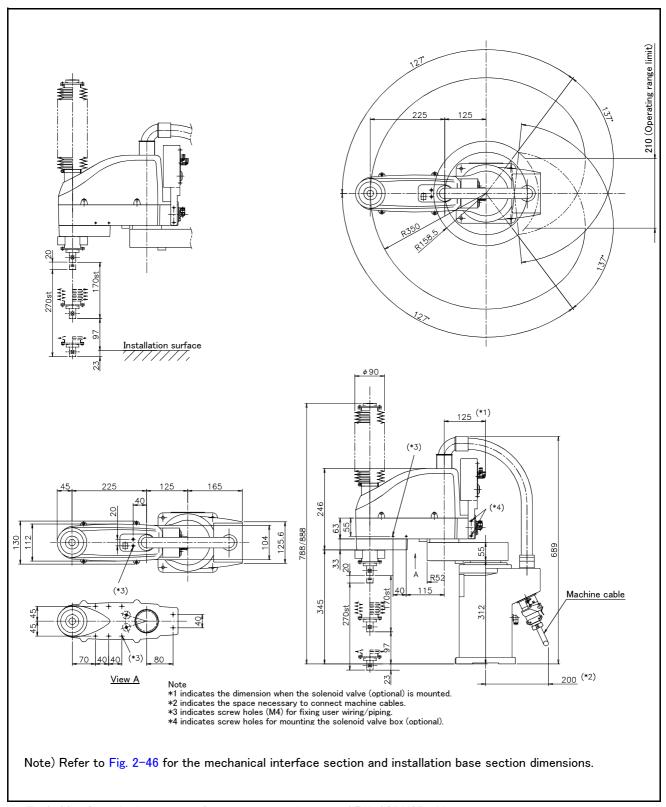


Fig.2-23: Outside dimensions, Operating range diagram of RH-6SDH35xxM

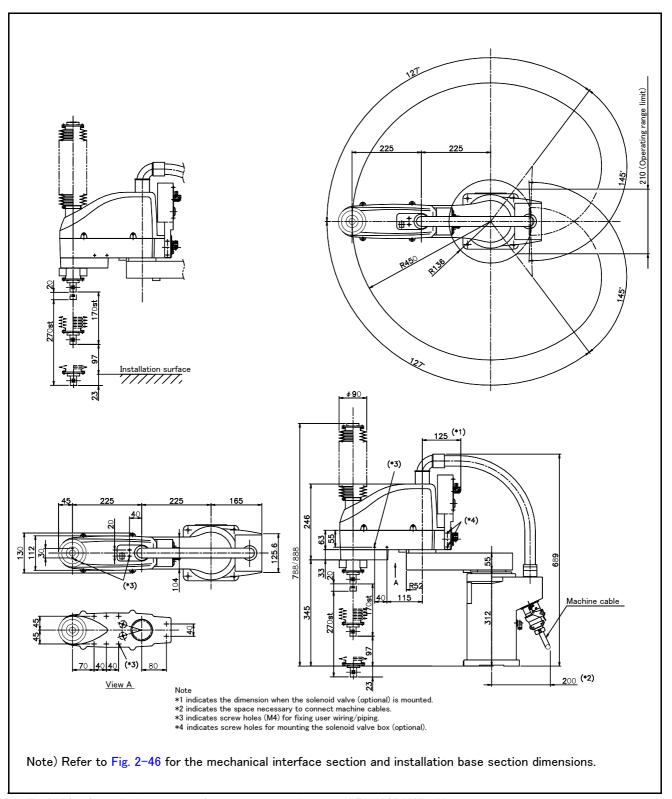
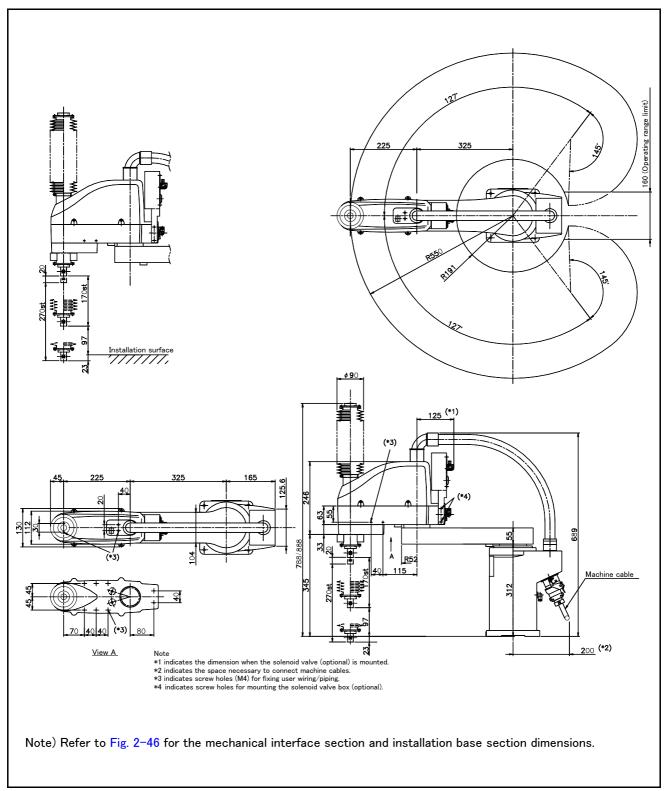


Fig.2-24: Outside dimensions, Operating range diagram of RH-6SDH45xxM



 $Fig. 2-25: Outside\ dimensions,\ Operating\ range\ diagram\ of\ RH-6SDH55xxM$

2.4.2 Outside dimensions • Operating range diagram of RH-12SDH series

(1) Standard Specification

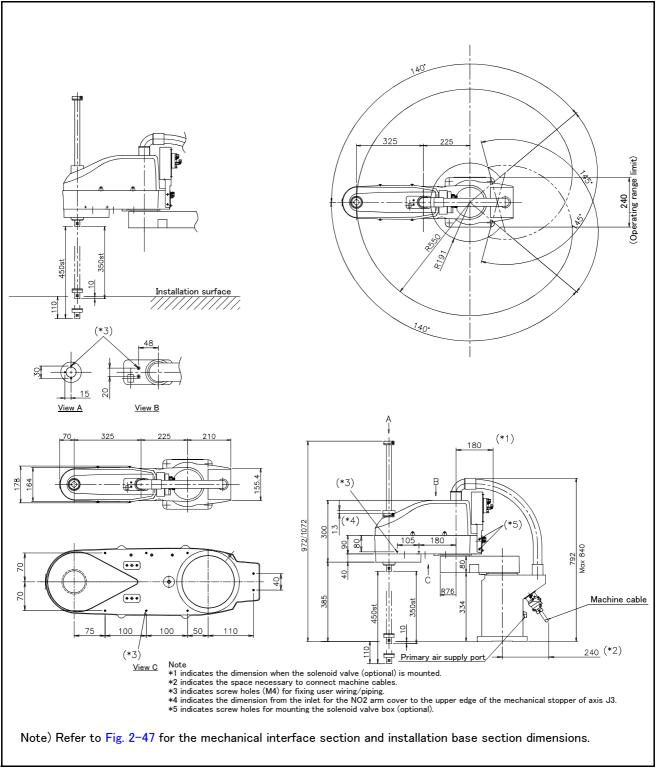


Fig.2-26: Outside dimensions, Operating range diagram of RH-12SDH55xx

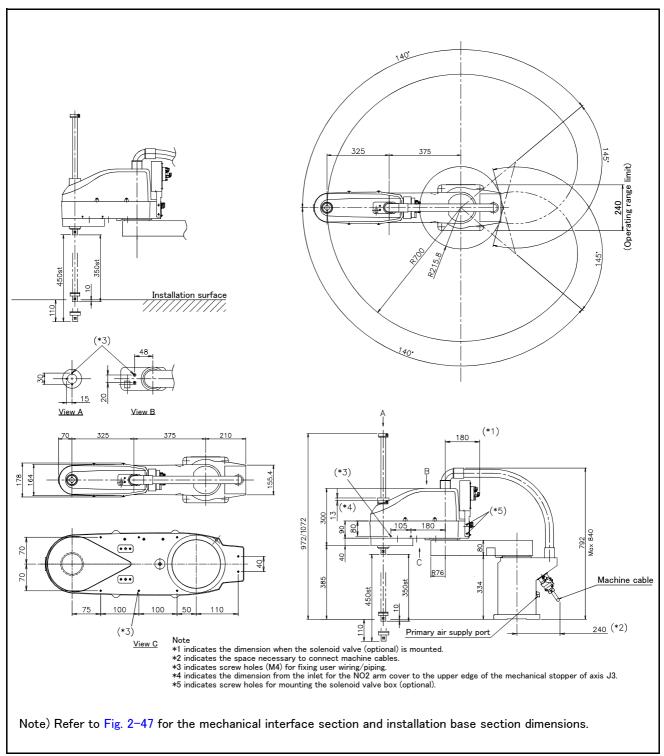


Fig.2-27: Outside dimensions, Operating range diagram of RH-12SDH70xx

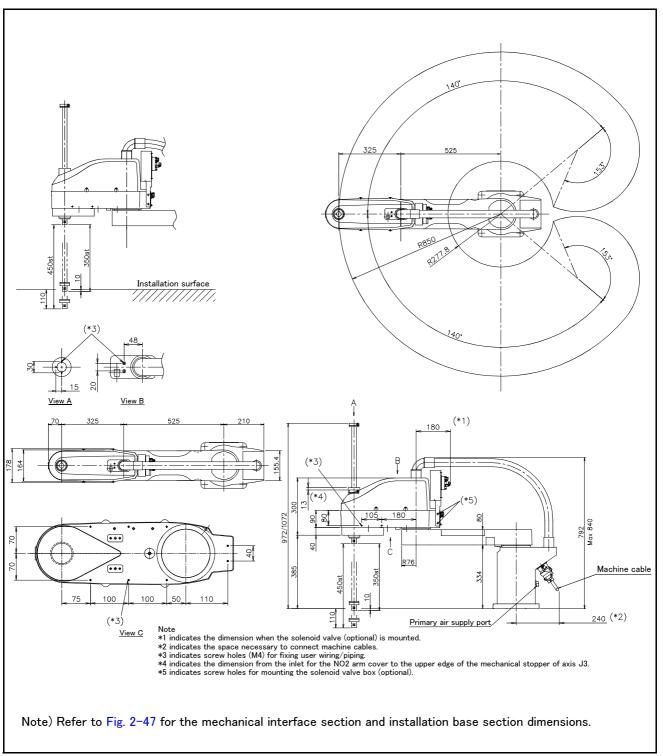


Fig.2-28: Outside dimensions, Operating range diagram of RH-12SDH85xx

(2) Clean Specification

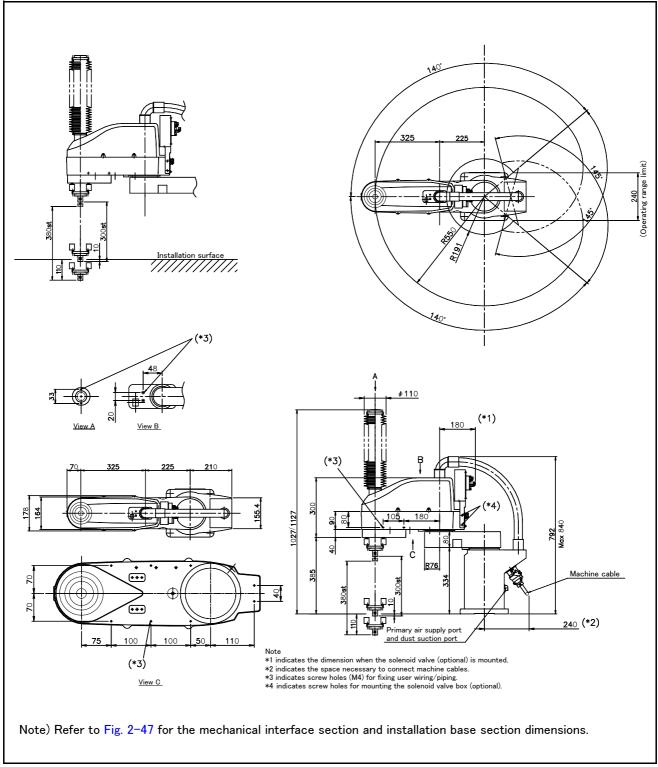


Fig.2-29: Outside dimensions, Operating range diagram of RH-12SDH55xxC

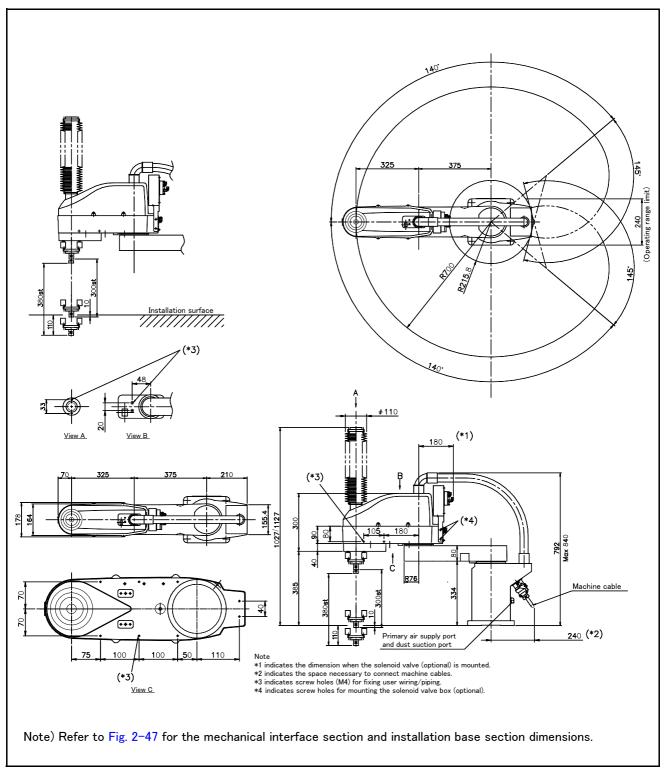


Fig.2-30 : Outside dimensions, Operating range diagram of RH-12SDH70xxC

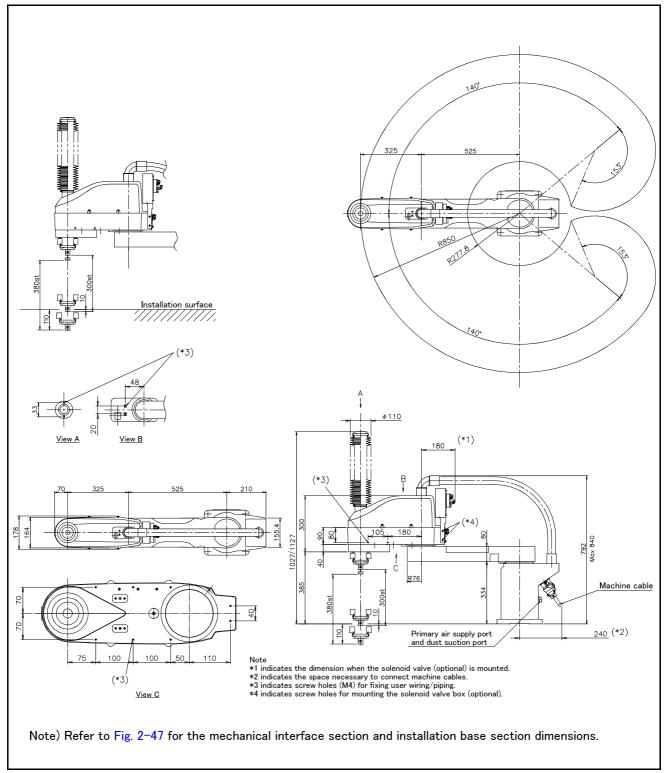


Fig.2-31: Outside dimensions, Operating range diagram of RH-12SDH85xxC

(3) Oil mist Specification

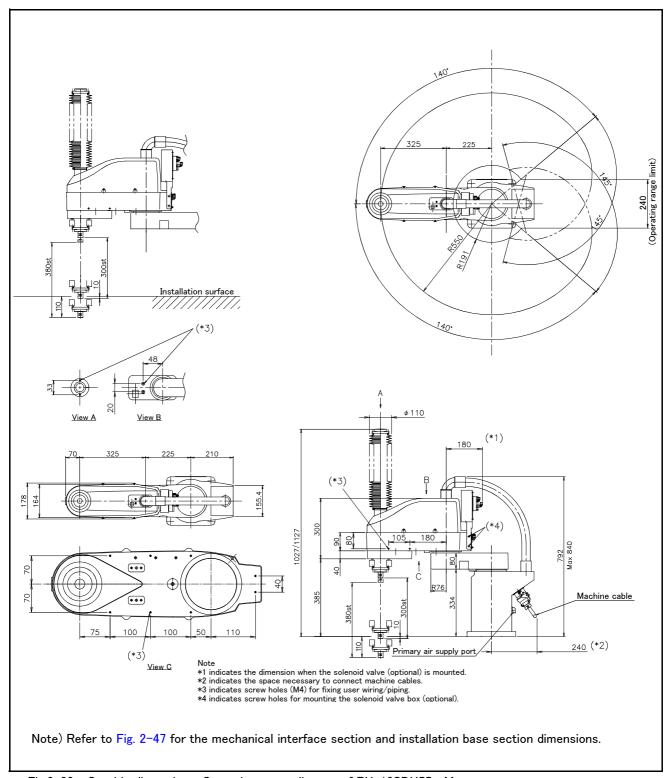


Fig.2-32: Outside dimensions, Operating range diagram of RH-12SDH55xxM

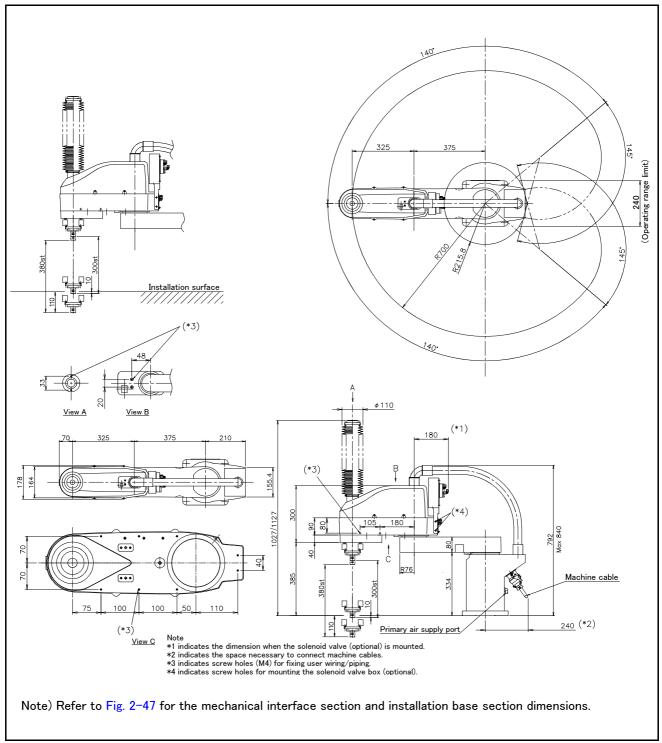


Fig.2-33: Outside dimensions, Operating range diagram of RH-12SDH70xxM

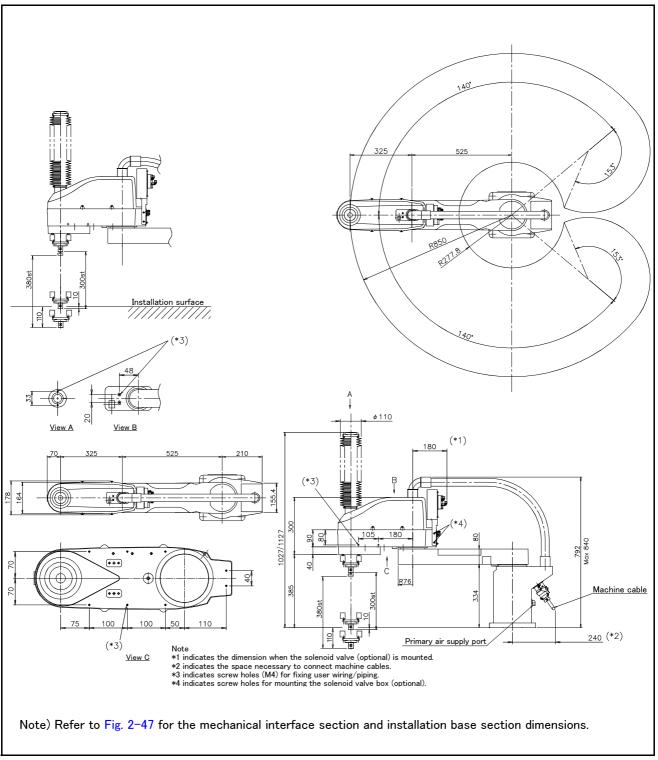


Fig.2-34: Outside dimensions, Operating range diagram of RH-12SDH85xxM

2.4.3 Outside dimensions • Operating range diagram of RH-18SDH series

(1) Srandard Specification

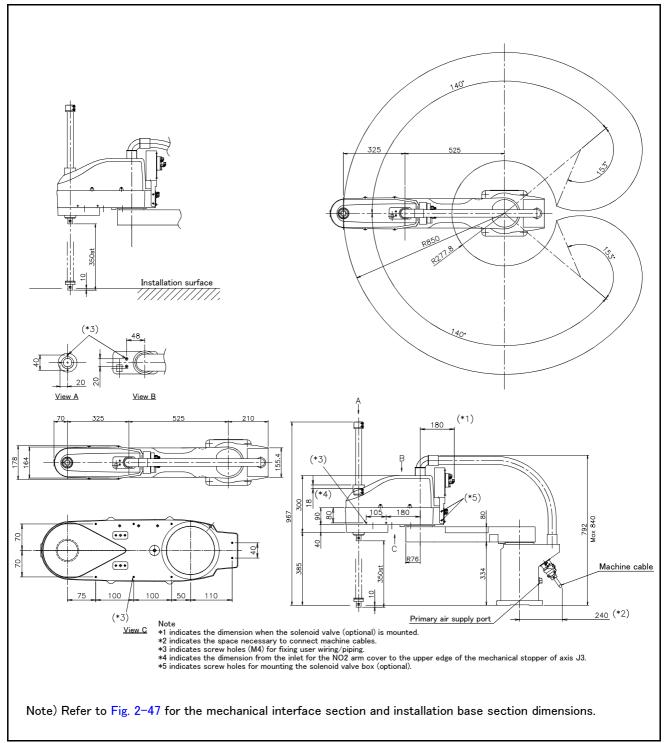


Fig.2-35: Outside dimensions, Operating range diagram of RH-18SDH8535

(2) Clean Specification

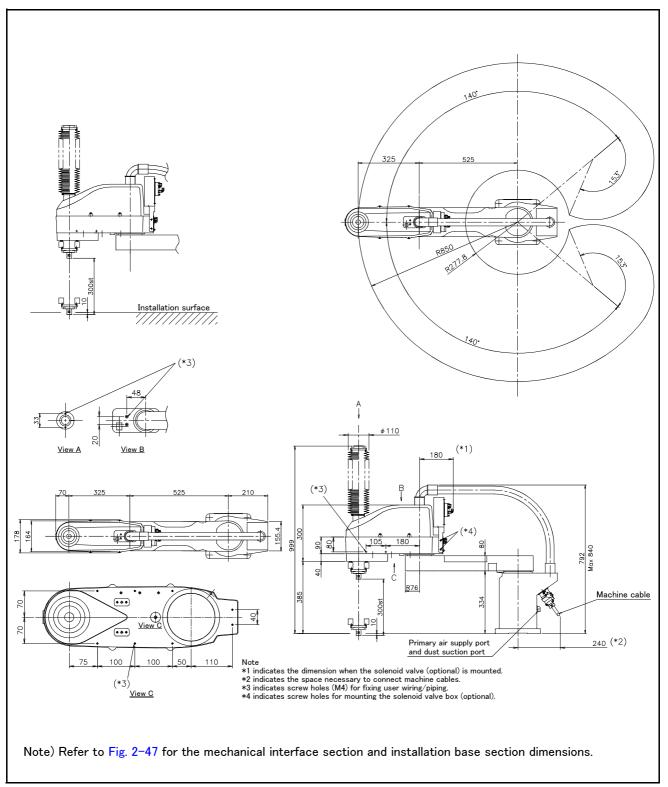


Fig.2-36: Outside dimensions, Operating range diagram of RH-18SDH8530C

(3) Oil mist Specification

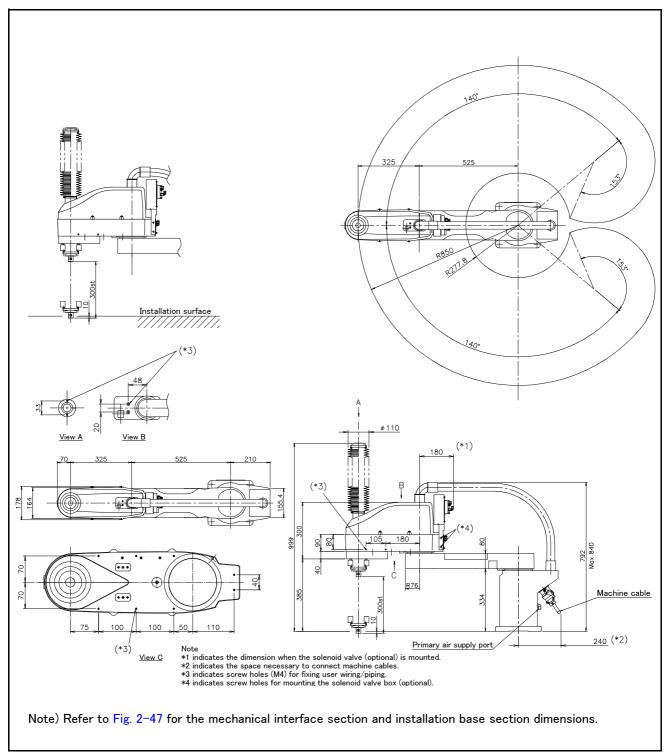


Fig.2-37: Outside dimensions, Operating range diagram of RH-18SDH8530M

2.4.4 Outside dimensions • Operating range diagram of RH-20SDH series

(1) Standard Specification

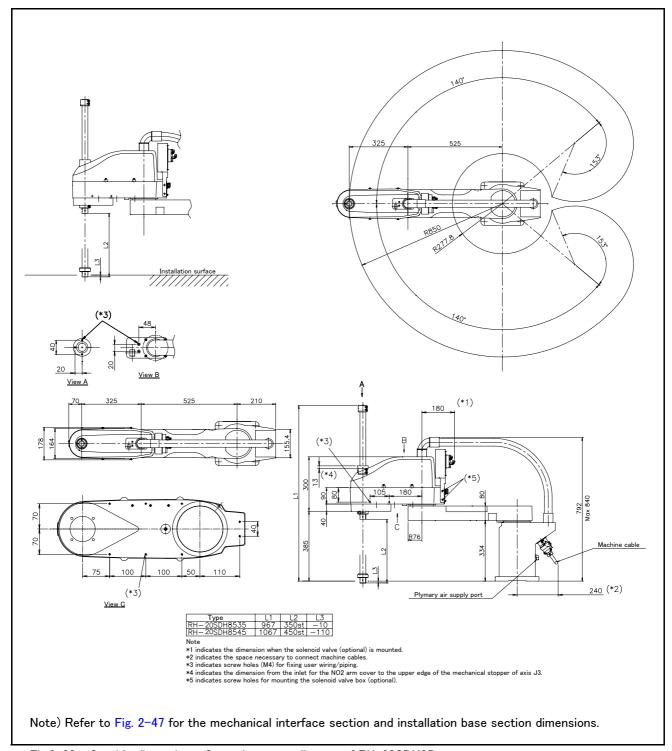


Fig.2-38: Outside dimensions, Operating range diagram of RH-20SDH85xx

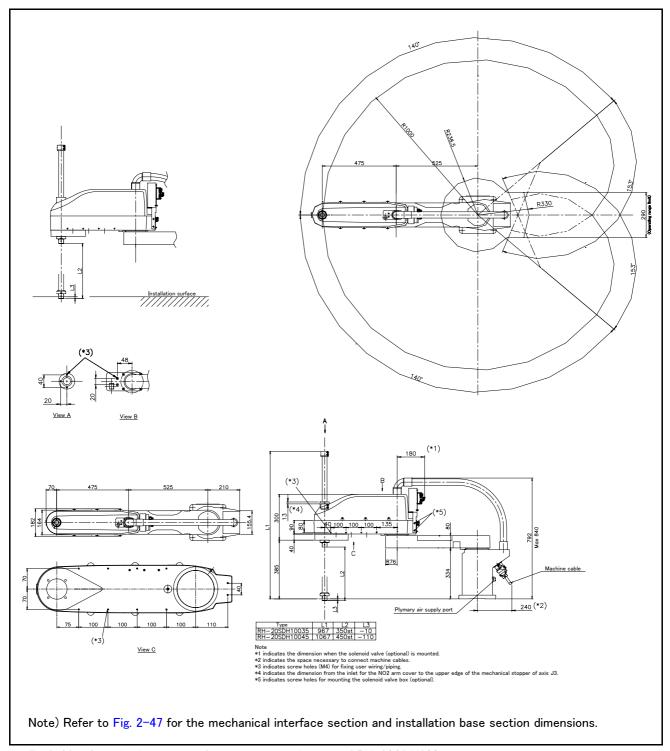


Fig.2-39: Outside dimensions, Operating range diagram of RH-20SDH100xx

(2) Clean Specification

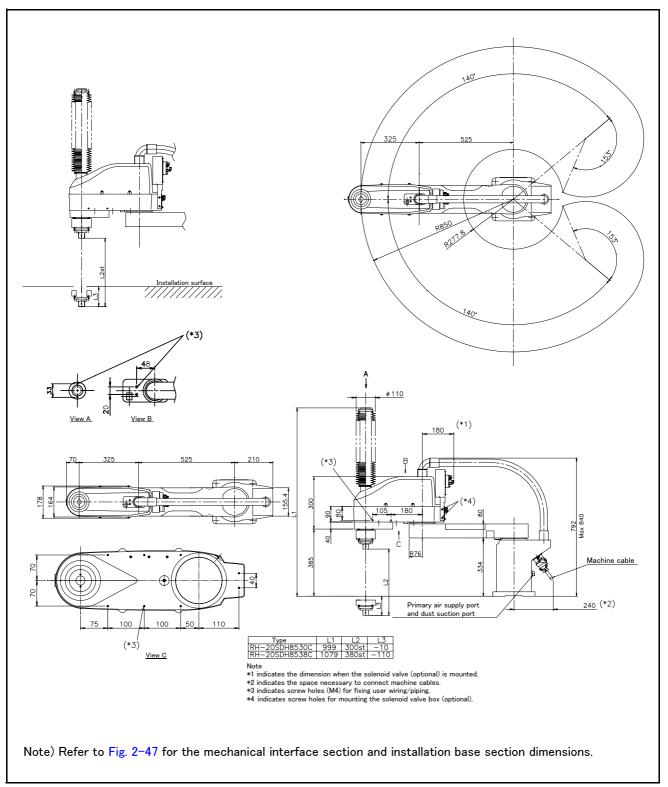


Fig.2-40: Outside dimensions, Operating range diagram of RH-20SDH85xxC

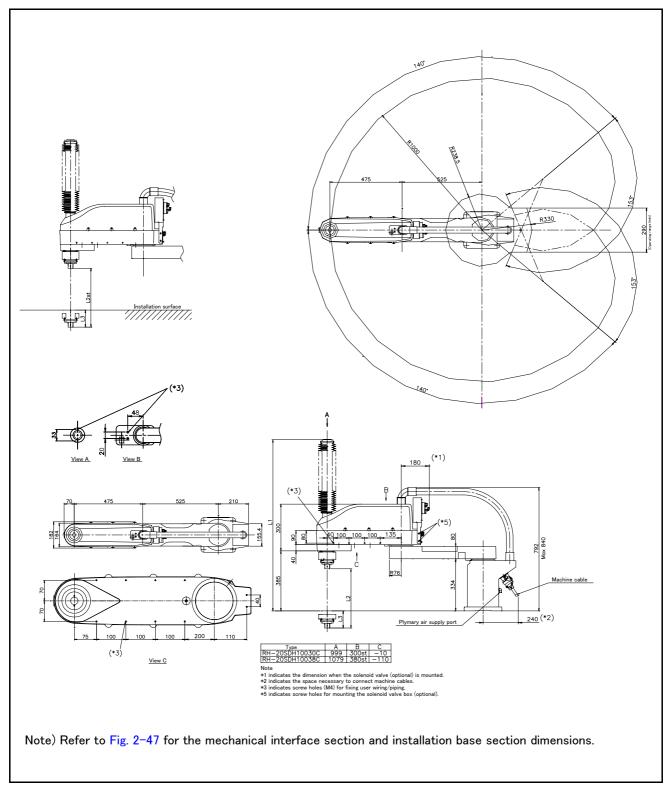


Fig.2-41: Outside dimensions, Operating range diagram of RH-20SD100xxC

(3) Oil mist Specification

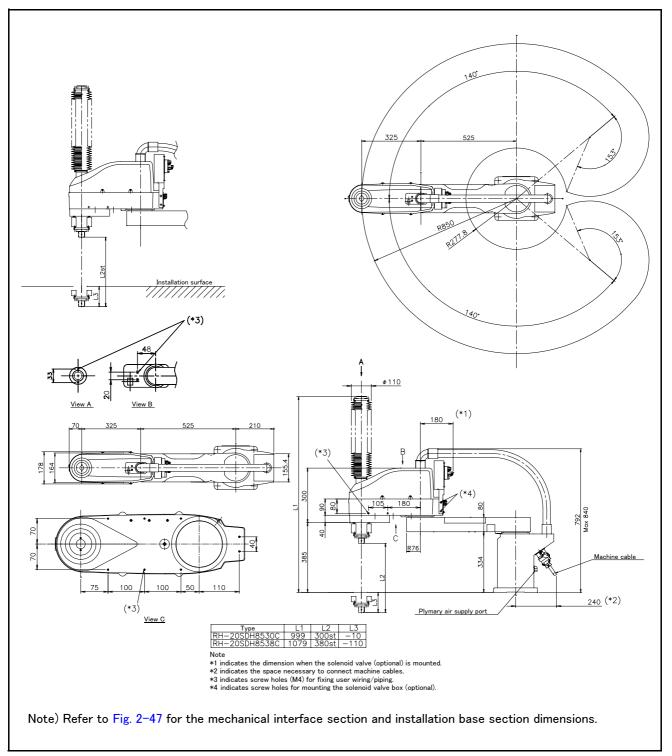
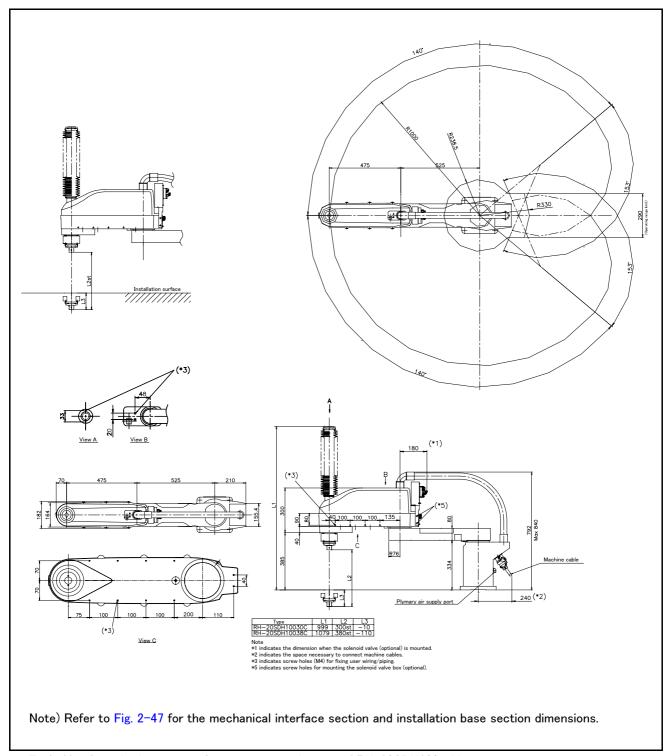


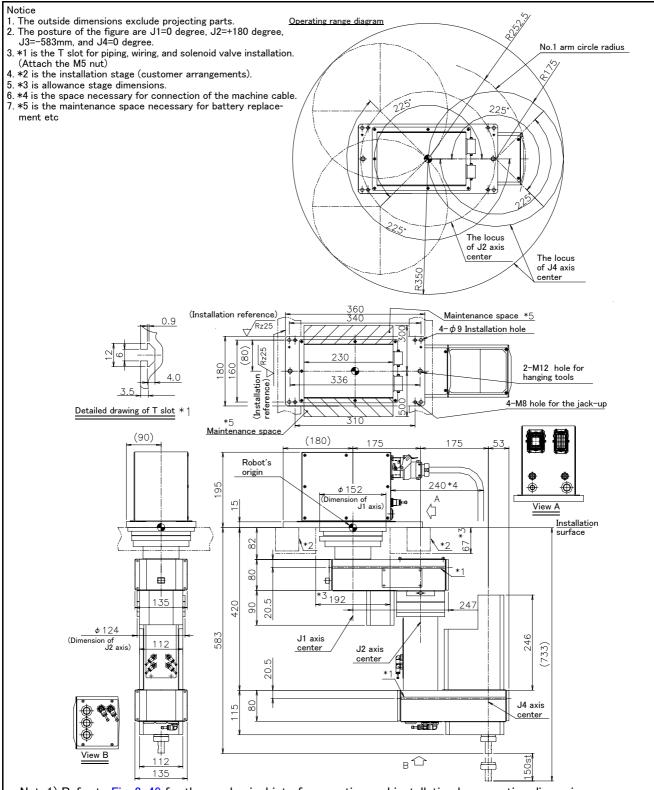
Fig.2-42: Outside dimensions, Operating range diagram of RH-20SDH85xxM



 $Fig. 2-43: Outside \ dimensions, \ Operating \ range \ diagram \ of \ RH-20SDH100xxM$

2.4.5 Outside dimensions • Operating range diagram of RH-3SDHR series

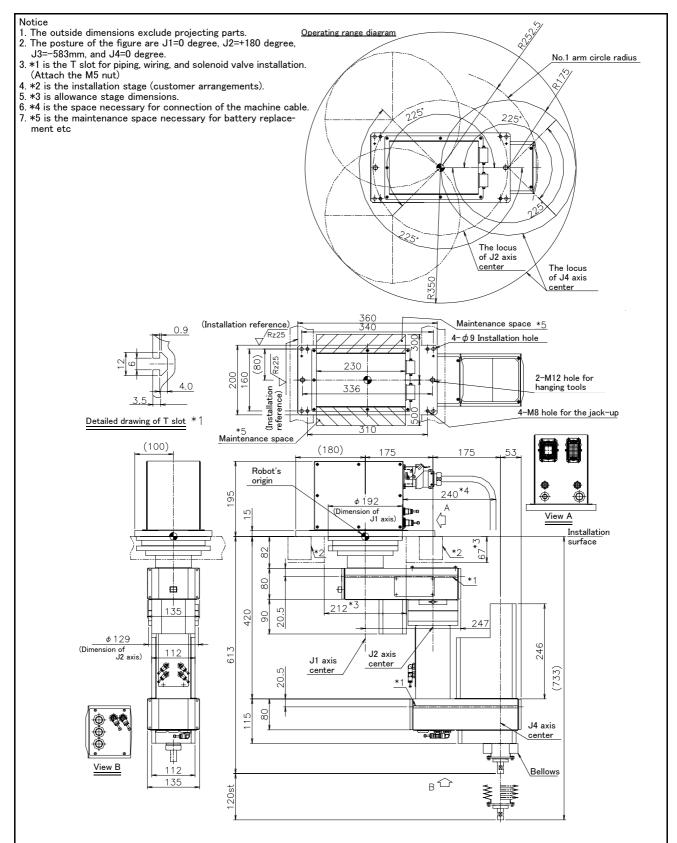
(1) Standard Specification



- Note1) Refer to Fig. 2-49 for the mechanical interface section and installation base section dimensions.
- Note2) Use of the optional solenoid valve set. The solenoid valve set installed at the side on the No.2 arm. (*1 mark) Take care at layout design.
- Note3) The position on the vertical extension of the "robot origin" becomes the singular point. Positioning and passage to this position with linear interpolation movement cannot be performed. Take care at layout design.

Fig.2-44: Outside dimensions, Operating range diagram of RH-3SDHR series

(2) Clean/Waterproof Specification



Note1) Refer to Fig. 2-49 for the mechanical interface section and installation base section dimensions.

Note2) Use of the optional solenoid valve set. The solenoid valve set installed at the side on the No.2 arm. (*1 mark) Take care at layout design.

Note3) The position on the vertical extension of the "robot origin" becomes the singular point. Positioning and passage to this position with linear interpolation movement cannot be performed. Take care at layout design.

Fig.2-45: Outside dimensions, Operating range diagram of RH-3SDHR series (Clean/Waterproof specification)

2.4.6 Mechanical interface and Installation surface

(1) Mechanical interface and Installation surface of RH-6SDH series

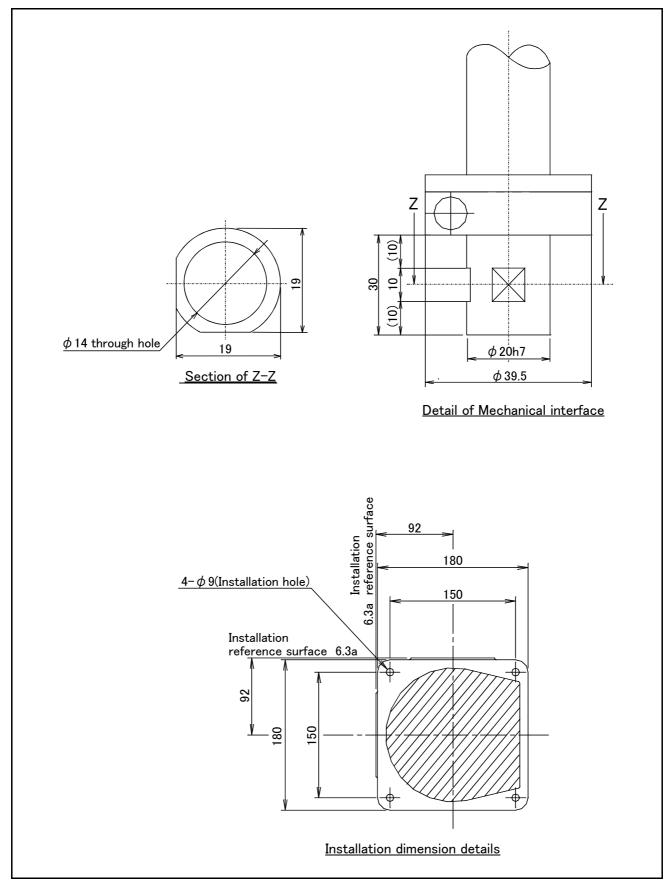


Fig.2-46: Mechanical interface and Installation surface of RH-6SDH series

(2) Mechanical interface and Installation surface of RH-12SDH/18SDH series

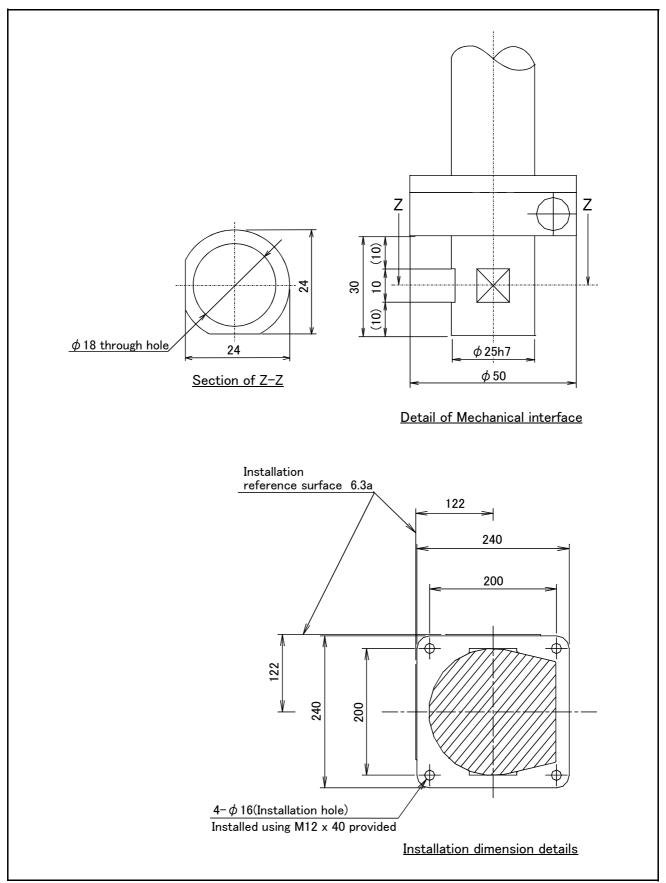


Fig.2-47: Mechanical interface and Installation surface of RH-12SDH/18SDH series

(3) Mechanical interface and Installation surface of RH-20SDH series

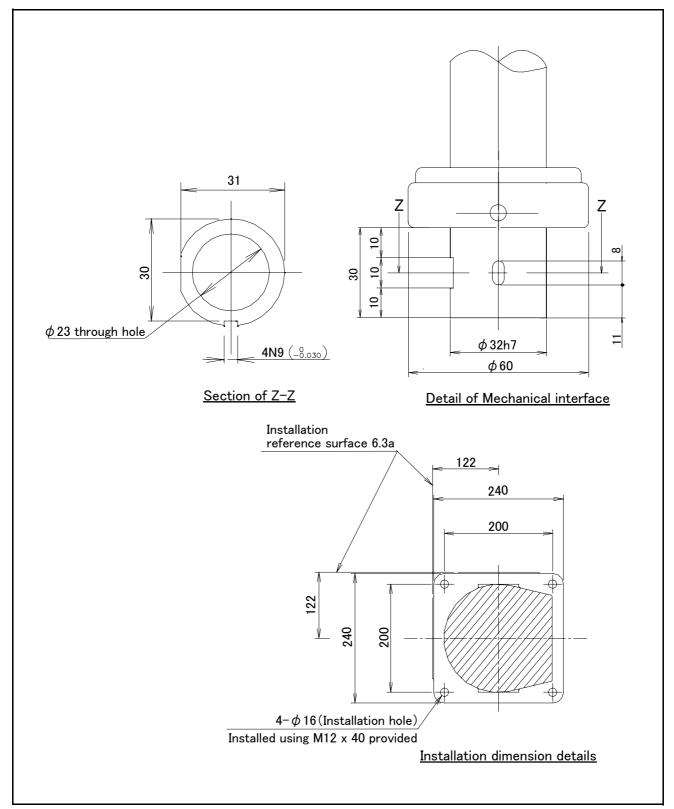


Fig.2-48: Mechanical interface and Installation surface of RH-20SDH series

(4) Mechanical interface and Installation surface of RH-3SDHR series (Standard specification)

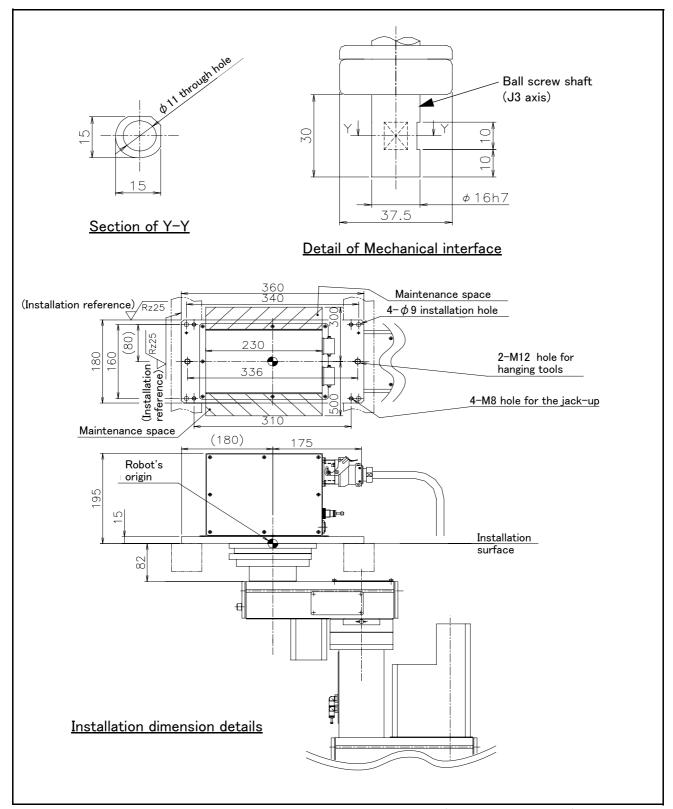


Fig.2-49: Mechanical interface and Installation surface of RH-3SDHR series (Standard specification)

A CAUTION

Don't give a shock to the ball screw shaft at the time of hand installation. Especially don't strike the shaft end by hammer etc. The ball screw shaft may be damaged.

(5) Mechanical interface and Installation surface of RH-3SDHR series (Clean/Waterproof specification)

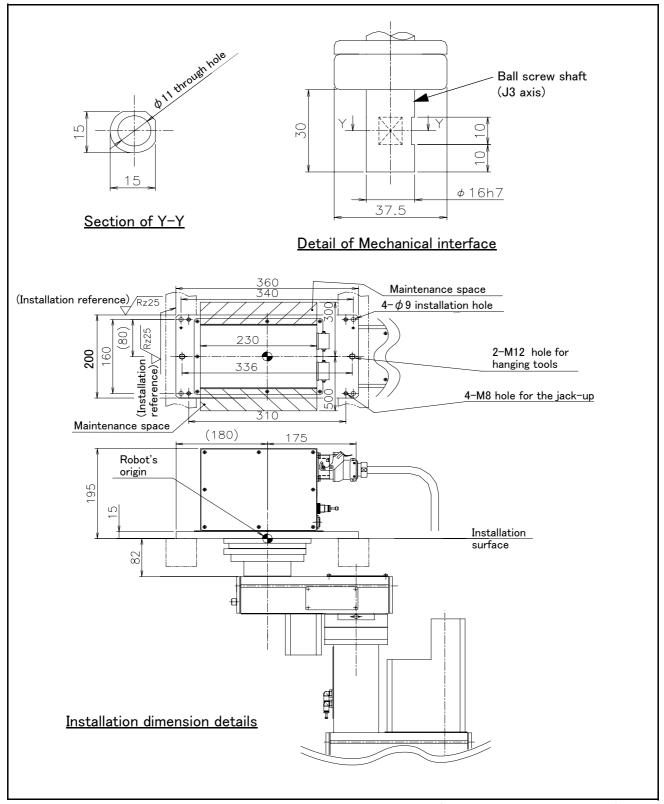


Fig.2-50: Mechanical interface and Installation surface of RH-3SDHR series (Clean/Waterproof specification)

A CAUTION

Don't give a shock to the ball screw shaft at the time of hand installation. Especially don't strike the shaft end by hammer etc. The ball screw shaft may be damaged.

2.4.7 Change the operating range

The operating ranges of both the J1, J2 and J3 axes can be limited. Change the mechanical stopper and the operating range to be set inside of that area.

If the operating range must be limited for example, to avoid interference with peripheral devices or to ensure safety--set up the operating range as shown below.

In addition, change of the operating range in RH-3SDHR series is optional. Refer to Page 101, "(2) Changing the operating range".

(1) Operating range changeable angle

The operating range must be set up at angels indicated by Table 2-21.

Table 2-21: Operating range changeable angle

Axis	Туре	Direction	Standard	Changeable angle				
RH-6	SDH series							
J1	RH-6SDH35*/45*/	+ side	+127 deg.	+90 deg.	+60 deg.	+30 deg.	0 deg.	Any one
	55*	Mechanical stopper angle	+130 deg.	+95 deg.	+65 deg.	+35 deg.	+5 deg.	point shown
		Mechanical stopper position	P11	P12	P13	P14	P15	at the left
		- side	-127 deg.	-90 deg.	-60 deg.	-30 deg.	0 deg.	Any one
		Mechanical stopper angle	-130 deg.	-95 deg.	-65 deg.	-35 deg.	-5 deg.	point shown
		Mechanical stopper position	N11	N12	N13	N14	N15	at the left
J2	RH-6SDH35*	+ side	+137 deg.	+117 deg.	+97 deg.			Any one
		Mechanical stopper angle	+139 deg.	+119 deg.	+99 deg.	_	_	point shown
		Mechanical stopper position	P21	P22	P23			at the left
		- side	-137 deg.	-117 deg.	-97 deg.			Any one
		Mechanical stopper angle	-139 deg.	-119 deg.	-99 deg.	_	_	point shown
		Mechanical stopper position	N21	N22	N23			at the left
	RH-6SDH45*/55*	+ side	+145 deg.	+125 deg.	+105 deg.			Any one point shown
		Mechanical stopper angle	+147 deg.	+127 deg.	+107 deg.	_	_	
		Mechanical stopper position	P21	P22	P23			at the left
		- side	-145 deg.	-125 deg.	-105 deg.			Any one
		Mechanical stopper angle	-147 deg.	-127 deg.	-107 deg.	-	_	point shown
		Mechanical stopper position	N21	N22	N23			at the left
J3	Standard	+ side	+297	Change is im	ossible.			
	specifications	- side +97 +115 to+ 257mm						
	Clean, oil-mist	+ side	+267	Change is im	· · · · · · · · · · · · · · · · · · ·			
	specifications	- side	+97	+115 to+ 227				
RH-1	2SDH/18SDH/20SDH s	eries		•				
J1	RH-12SDH55*/70*/	+ side	+140 deg.	+105 deg.	+75 deg.	+45 deg.	+15 deg.	Any one
	85* RH-18SDH85*	Mechanical stopper angle	+143 deg.	+110 deg.	+80 deg.	+50 deg.	+20 deg.	point shown
		Mechanical stopper position	P11	P12	P13	P14	P15	at the left
	RH-20SDH85* RH-20SDH100*	- side	-140 deg.	-105 deg.	-75 deg.	-45 deg.	-15 deg.	Any one
	KH-203DH100*	Mechanical stopper angle	-143 deg.	-110 deg.	-80 deg.	-50 deg.	-20 deg.	point shown
		Mechanical stopper position	N11	N12	N13	N14	N15	at the left
J2	RH-12SDH55*/70*	+ side	+145 deg.	+125 deg.				Any one
		Mechanical stopper angle	+150 deg.	+130 deg.	_	_	_	point shown
		Mechanical stopper position	P21	P22				at the left
		- side	-145 deg.	-125 deg.				Any one
		Mechanical stopper angle	-150 deg.	-130 deg.	-	_	_	point shown
		Mechanical stopper position	N21	N22	1			at the left
	RH-12SDH85*	+ side	+153 deg.	+125 deg.				Any one
	RH-18SDH85*	Mechanical stopper angle	+155 deg.	+130 deg.] –	_	_	point shown
	RH-20SDH85*	Mechanical stopper position	P21	P22	1			at the left
	RH-20SDH100*	- side	-153 deg.	-125 deg.				Any one
		Mechanical stopper angle	-155 deg.	-130 deg.	-	_	_	point shown
		Mechanical stopper position	N21	N22	1			at the left

Note1) The * symbols next to the robot types indicate the up/down stroke length, environment specification, specification with controller protection box (RH-6SDH series) or controller specification with countermeasure against oil mist (RH-12SDH/18SDH/20SDH series). In this case, it is possible to change the movement ranges shown in Table 2-21 for any model.

- Note2) The changeable angle shown in Table 2-21 indicates the operation range by the software. The mechanical stopper angle in the table shows the limit angle by the mechanical stopper. Use caution when laying out the robot during the designing stage.
- Note3) The changeable angle can be set independently on the + side and side.
- Note4) Refer to Fig. 2-51 and Fig. 2-52 for mechanical stopper position. The J3 axis makes the mechanical stopper slide.
- (2) The change method of the operating range
- Installation of the mechanical stopper
 - 1) Turn off power to the controller.
 - 2) Install the hexagon socket bolt in the screw hole to the angle to set up referring to Table 2-21 and Fig. 2-51, and Fig. 2-52. About the mechanical stopper position and the relation of bolt size, the J1 axis is shown in Fig. 2-51, and the J2 axis is shown in Fig. 2-52. When the screw hole is covered by the arm, move the No.1 arm or the No.2 arm slowly by hand.

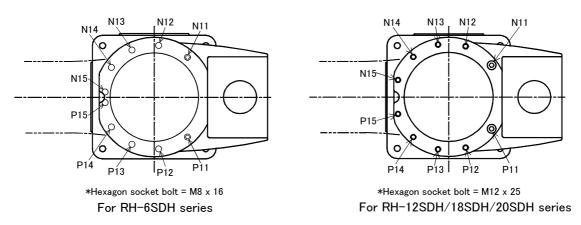


Fig.2-51: Mechanical stopper position (J1 axis)

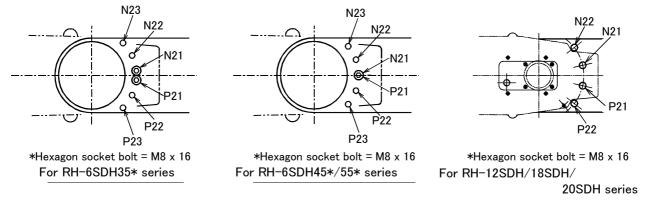


Fig.2-52: Mechanical stopper position (J2 axis)

- Change the operating range parameters Specify the operating range to parameters MEJAR with appropriate values (variable angles given in Table 2-21) by the following steps:
 - 1) Turn on power to the controller.
 - 2) Set up the operating range changed into Parameter MEJAR MEJAR: (J1 minus(-) side, J1 plus(+) side, J2 minus(-) side, J2 plus(+) side, \square , ...).
- Change the mechanical stopper origin position parameters If you have changed operating range on the J1 minus(-) side or J2 plus(+) side, change mechanical stopper origin position parameters by the following step:
 - 1) Set MORG parameter to the angle which set mechanical stopper position. MORG: (J1 mechanical stopper position, J2 mechanical stopper position, \square , \square , ...).

■ Check the operating range

After changing the parameter, turn off the controller power and turn on again. Then, move the axis changed by joint jog operation to the limit of the operating range.

Confirm that the robot stops by limit over at the changed angle.

This completes the procedure to change the operating range.

2.5 Tooling

2.5.1 Wiring and piping for hand

Shows the wiring and piping configuration for a standard-equipped hand.

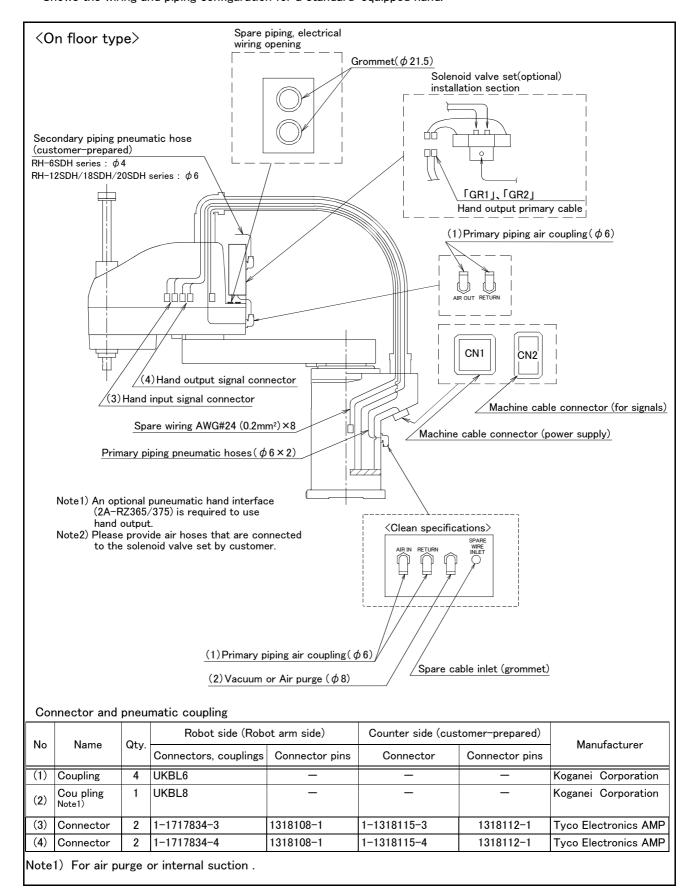


Fig.2-53: Wiring and piping for hand (Floor installation type)

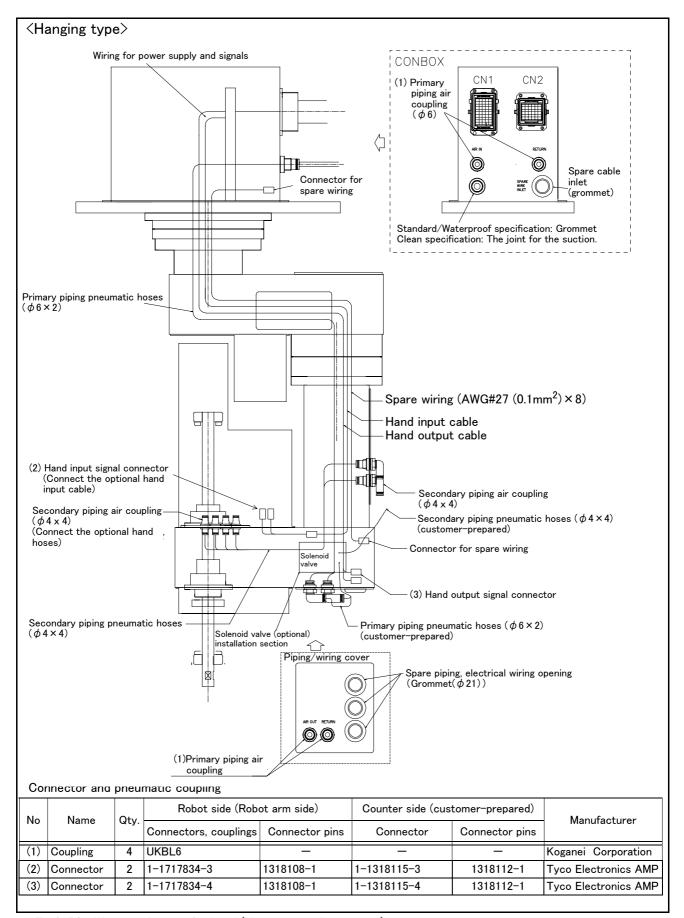


Fig.2-54: Wiring and piping for hand (Hanging installation type)

2.5.2 Internal air piping

(1) Floor installation type

- 1) Standard specification/Oil mist specifications
 - The robot has two ϕ 6 x 4 urethane hoses from the pneumatic entrance on the base section to the shoulder cover.

The base and No.2 arm sides of the hose end are two air joints for ϕ 6 hoses.

The solenoid valve set (optional) can be installed to the side on No.2 arm.

- Refer to Page 102, "(3) Solenoid valve set" for details on the electronic valve set (optional).
- Protection performance can be improved by pressurizing the inside of the robot arm. Since the joint (AIR PURGE) of phi 8 is prepared at the rear of the base section, please supply the dry air for pressurization from this joint. Refer to Page 35, "2.2.8 Protection specifications" for the details of dry air.

2) Clean specification

- The clean type basically includes the same piping as the standard type.
- With the clean specification, a ϕ 8 coupling is provided in the base section for suction inside the machine. For use, connect it to the suction port of the vacuum pump or the coupling on the "VACUUM" side of the vacuum generating valve. Moreover, to clean the exhaust from the vacuum pump or vacuum generator, use the exhaust filter (prepared by the customer).
- Refer to Page 38, "2.2.9 Clean specifications" for details of the vacuum for suction.
- Use clean air as the air supplied to the vacuum generator.

(2) Hanging installation type

- 1) Standard/Waterproof (IP65) specification
 - •The robot has two ϕ 6 x 4 urethane hoses from the pneumatic entrance on the base section to the No.2 arm.
 - The base and No.2 arm sides of the hose end are two air joints for ϕ 6 hoses.
 - The solenoid valve set (optional) can be installed to the side on No.2 arm.
 - Refer to Page 28, "(2) Solenoid valve set" for details on the electronic valve set (optional).
 - The four air hoses (ϕ 4) are piped as the secondary from the No.2 arm back end to near the shaft.

2) Clean specification

- The clean type basically includes the same piping as the standard type.
- With the clean specification, a ϕ 8 coupling is provided in the base section for suction inside the machine. For use, connect it to the suction port of the vacuum pump or the coupling on the "VACUUM" side of the vacuum generating valve. Moreover, to clean the exhaust from the vacuum pump or vacuum generator, use the exhaust filter (prepared by the customer).
- Refer to Page 38, "2.2.9 Clean specifications" for details of the vacuum for suction.
- Use clean air as the air supplied to the vacuum generator.

2.5.3 Internal wiring for the pneumatic hand output cable

When the controller uses the optional pneumatic hand interface (2A-RZ365/2A-RZ375), the hand output signal works as the pneumatic hand cable.

(1) Floor installation type

•The hand output primary cable extends from the connector PCB of the base section to the back side of the no.2 arm. (AWG#24(0.2mm²)x 2 : 8 cables) The cable terminals have connector bridges for eight hand outputs. The connector names are GR1 and GR2.

The separate cable (optional "hand output cable 1S-GR35S-02") is necessary, to extend the cable to outside of the arm.

The hand output cable is located outside at the time of shipping. If this cable is not used, place the connectors for GR1 and GR2 inside, and install the attached grommet. For the protection specifications, fill the fringe of the grommet with silicon rubber.

(2) Hanging installation type

•The hand output primary cable extends from the connector PCB of the base section to the back side of the no.2 arm. (AWG#24(0.2mm²)x 2:8 cables) The cable terminals have connector bridges for eight hand outputs. The connector names are GR1 and GR2. The separate cable (optional "hand output cable 1S-GR35S-02") is necessary, to extend the cable to outside of the arm.

2.5.4 Internal wiring for the hand check input cable

(1) Floor installation type

- The hand input cable extends from the connector PCB of the base section to the No.2 arm. (AWG#24(0.2mm²)x 2 : 12 cables) The cable terminals have connector bridges for eight hand inputs. The connector names are HC1 and HC2.
- The hand check signal of the pneumatic hand is input by connecting this connector.
 To extend the wiring to the outside of the arm, a separate cable (optional "hand input cable "1S-HC35C-02" IP65 is recommended) is required.

(2) Hanging installation type

- The hand input cable extends from the connector PCB of the base section to the No.2 arm.
 (AWG#24(0.2mm²)x 2: 6 cables) The cable terminals have connector bridges for four hand inputs. The connector names are HC1 and HC2.
- The hand check signal of the pneumatic hand is input by connecting this connector.

2.5.5 Spare Wiring

(1) Standard type

As spare wiring, four pairs of cab tire cables (RH-6SDH/12SDH/18SDH/20SDH series: AWG#24(0.2mm²), RH-3SDHR series: AWG#27(0.1mm²), total is eight cores both) are preinstalled between the base section and the No.2 arm rear section. Customer can utilize it. Refer to the separate "Instruction Manual/ROBOT ARM SETUP & MAINTENANCE" for details.

Both ends of the wire terminals are unprocessed. Use them under the following circumstances:

- For folding as the hand output cable when installing the solenoid valve in outside the robot.
- For when installing six or more hand I/O points for the sensor in the hand section (Connects to the parallel I/O general purpose input.)

Reference) Pin assignment of the connector, and the matching connector

Pin assignment

Pin	Color	
A1	Red	
A2	Brown	
A3	Green	
A4	Black	
B1	Orange	
B2	White	
B3	Yellow	
В4	Blue	

Robot side connector

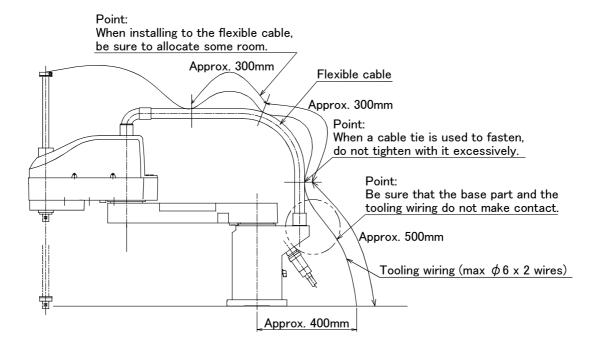
Connection place	tion place Connector		Maker	
Base portion 2-1318115-4		-	Tyco Electronics AMP K.K.	
Fore arm portion 2-1717834-4		-		

Other party connector (recommendation)

Connection place	Connector	Contactor	Maker
Base portion	2-1717834-4	1318108-1	Tyco Electronics AMP K.K.
Fore arm portion	2-1318115-4	1318112-1	

2.5.6 Precautions for piping to the flexible cable

If the piping of the hand is performed to the flexible cable of this robot, be sure to perform wiring and piping by following the precautions listed below so that they will not interfere with the functionality of the flexible cable.



If many hand cables are installed to the flexible cable and depending on the manner of installation, excessive force may be applied to the flexible cable and the life span of the flexible cable may be shortened and also the mounting nuts of the flexible cable may come loose.

2.5.7 About the Installation of Tooling Wiring and Piping (Examples of Wiring and Piping)

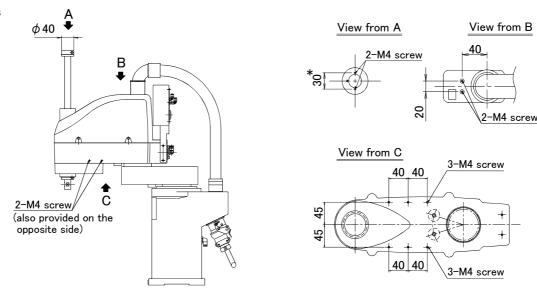
The customer is required to provide tooling wiring, piping and metal fixtures.

Screw holes are provided on the robot arm for the installation of tooling wiring, piping and metal fixtures. (Refer to the Table 2-55, Table 2-56, Table 2-57 and Table 2-58.)

The length of wiring and piping and the installation position on the robot must be adjusted according to the work to be done by the robot. Please use the following example as reference. Pay extra attention to the precautions and interfering points described in the example during the adjustment.

- · A hand input cable and a hand curl cable are available as optional accessories for your convenience.
- · After performing wiring and piping to the robot, operate the robot at low speed to make sure that each part does not interfere with the robot arm and the peripheral devices. (Interfering points and precautions are indicated in the example.)
- · Please be aware that dust may be generated from friction if wires and pipes come into contact with the robot arm when using it according to the clean specifications.

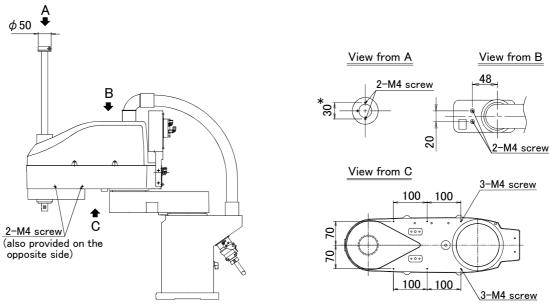
RH-6SDH series



* The dimension is 33 mm for the clean/oil mist specifications.

Fig.2-55: Location of screw holes for fixing wiring/piping (RH-6SDH series)

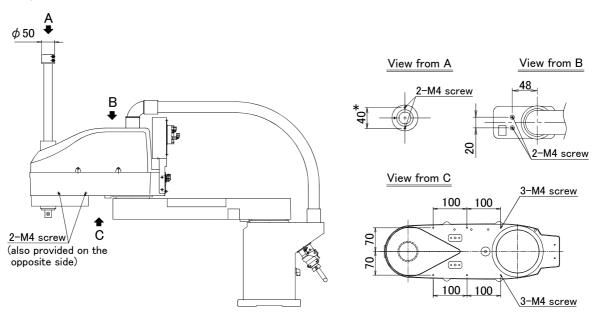
RH-12SDH series



 $\boldsymbol{*}$ The dimension is 33 mm for the clean/oil mist specifications.

Fig.2-56: Location of screw holes for fixing wiring/piping (RH-12SDH series)

RH-18SDH/20SDH series



* The dimension is 33 mm for the clean/oil mist specifications.

Fig.2-57: Location of screw holes for fixing wiring/piping (RH-18SDH/20SDH series)

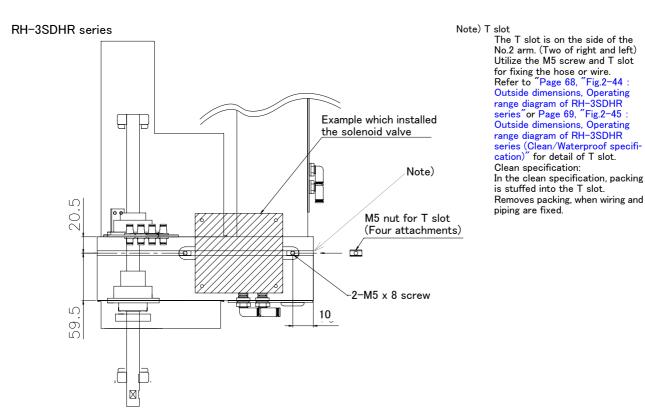


Fig.2-58: Location of screw holes for fixing wiring/piping (RH-3SDHR series)

(1) Example of wiring and piping <1>

This method is effective when the rotation of the hand is small (within ± 90 deg.) and provides easy maintenance of the robot arm as well as during the replacement of wiring and piping.

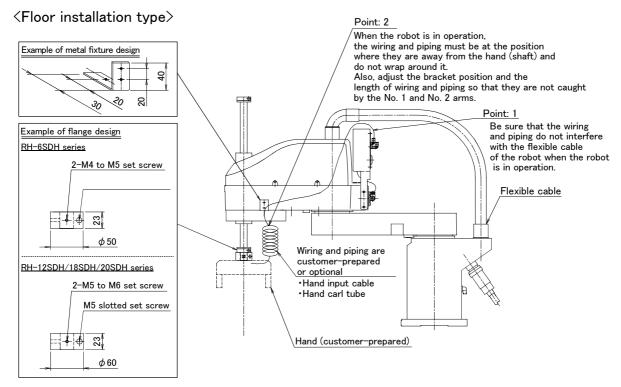


Fig.2-59: Example of wiring and piping <1> (Floor installation type)

<Hanging type> Example) How to pass the ϕ 4 air hose into the shaft *1) Adjustment of the fixing position In the condition that the J3 axis is upper limit and the J4 axis is 0 degree, align the top of air tube with the upper end of the Piping fixing bracket. Hand tube (ϕ 4 x 4: customer preparation) Hand tube (ϕ i3 x 4: optional) and the hand input cable (optional) Hand input cable Clamp position (cutting two places) Fixing by cable tie Hand tube $(\phi 4 \times 4)$ customer preparation) *Use, when letting the tube pass in the shaft. Hand tube Clamp position $(\phi 6 \times 2: customer preparation)$ Fixing by cable tie etc. Air tube Union (ϕ 4 to ϕ 3) Attachment Hand input cable Example of the customer preparation tool

Notes in wiring

- 1. The air hose which can be passed in the shaft is four ϕ 4 hoses maximum. (Customer preparations)
- 2. Wire the cable and piping the tube without interference with ball screw and cover.
- 3. Because to prevent the bend of the air tube, secure the minimum radius with which tube can be bent.
- 4. Add the mass of solenoid valve to mass of hand and set to parameter: HNDDAT. (RH-3SDHR series only)
- 5. The hand tube (four ϕ 3 tubes) and the hand input cable (4 point) are prepared optional. Please confirm that there is no rubbing or crack etc per six months.

Fig.2-60 : Example of wiring and piping $\langle 1 \rangle$ (Hanging installation type)

(2) Wiring and piping example <2>

If wiring and piping are fed through the hollow section of the shaft, the wiring and piping to the hand can be streamlined.

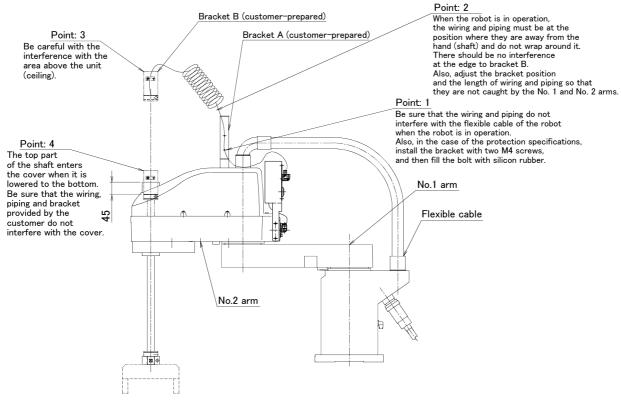
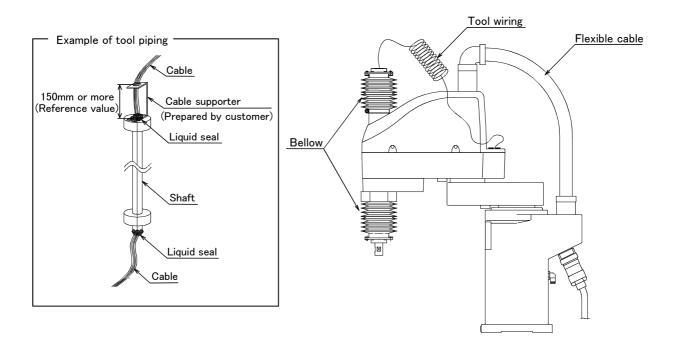


Fig.2-61: Example of wiring and piping <2>

(3) Precautions for the oil mist specification and clean specification

- Bellows are attached to the tips so confirm not interfering in the tooling wiring, piping, and the flexible tube.
- Please use wiring materials that are sufficiently flexible. Furthermore, please perform the wiring in such a way that the bending radii of the selection tube and wires will not become less than the minimum values allowed while the robot is operating.



(4) Precautions for the clean specification

The top and bottom parts of the through hole of the tip shaft are taped at shipment.

Perform the following actions as necessary in order to ensure that the robot is sufficiently clean during the operation:

- 1) When the through hole of the shaft is not used
 - · Keep the tip shaft taped while the robot is in use.
- 2) When the through hole of the shaft is used for wiring.
 - Peel the tape of the tip shaft off and perform the necessary wiring. Once the wiring is completed, seal the tip shaft using liquid seal in order to avoid accumulation of dust.
 - ·Perform the wiring in such a way that the wires around the area below the tip shaft will not get into contact with other parts while the robot is operating.

2.5.8 Wiring and piping system diagram for hand Shows the wiring and piping configuration for a standard-equipped hand.

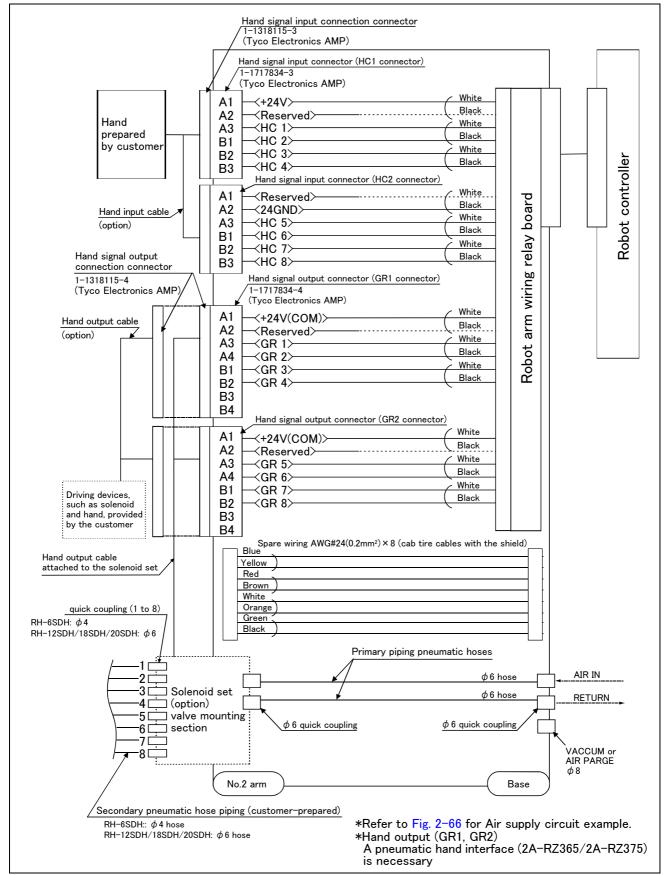


Fig.2-62: Wiring and piping system diagram for hand and example the solenoid valve installation (RH-6SDH/12SDH/18SDH/20SDH series: Sink type)

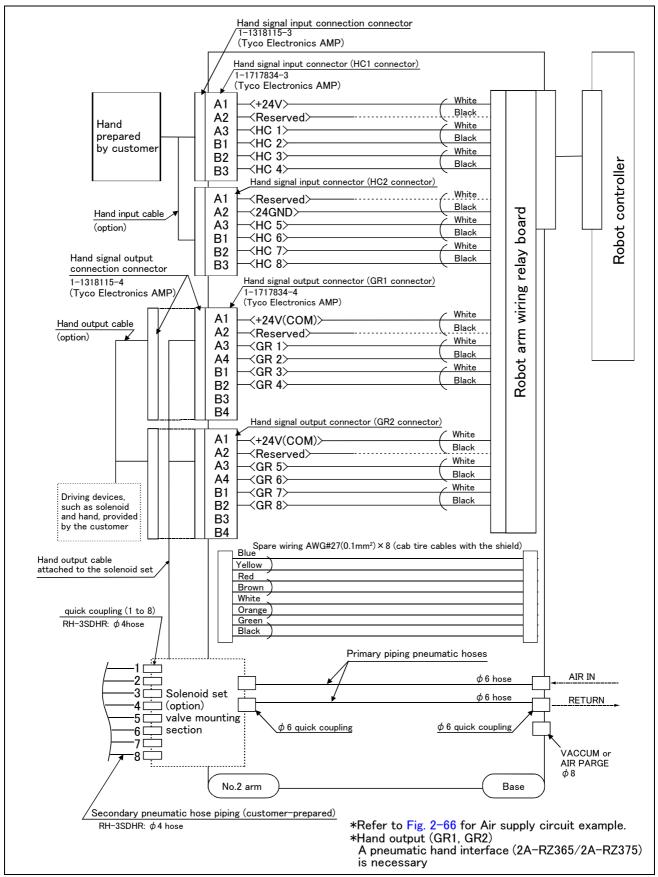


Fig.2-63: Wiring and piping system diagram for hand and example the solenoid valve installation (RH-3SDHR series: Sink type)

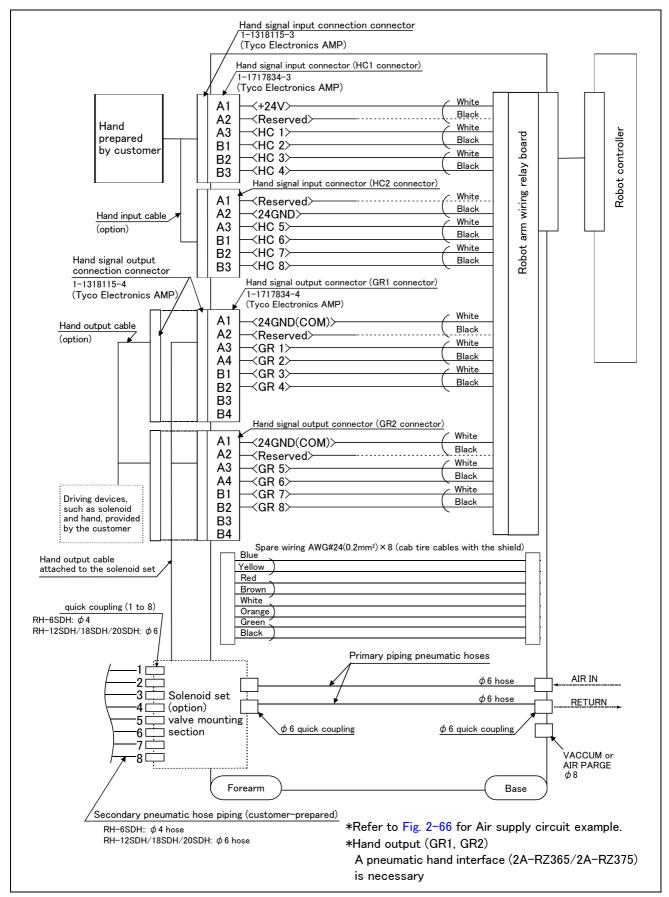


Fig.2-64: Wiring and piping system diagram for hand and example the solenoid valve installation (RH-6SDH/12SDH/18SDH/20SDH: Source type)

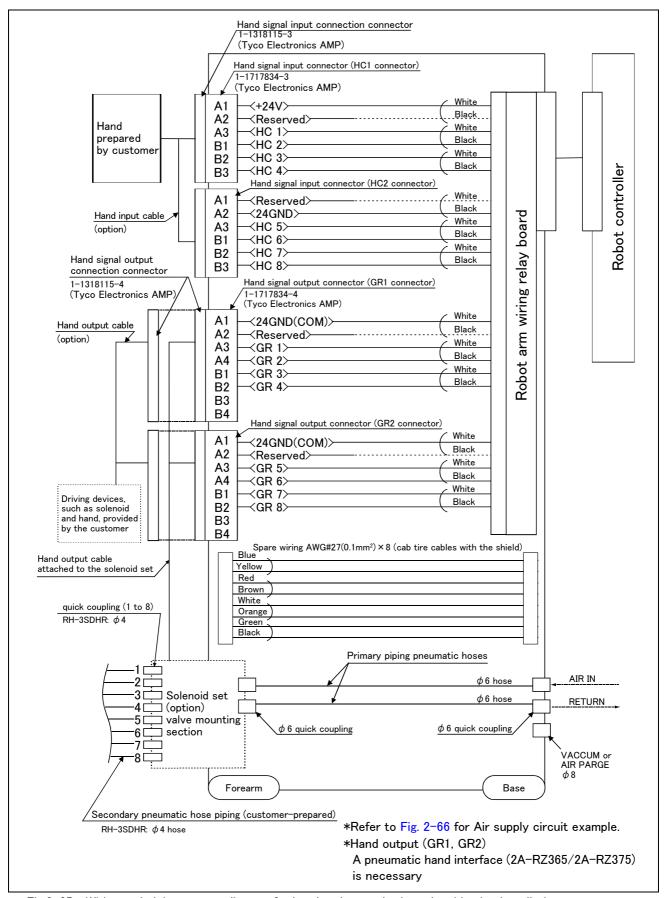


Fig.2-65: Wiring and piping system diagram for hand and example the solenoid valve installation (RH-3SDHR series: Source type)

2.5.9 Electrical specifications of hand input/output

Table 2-22: Electrical specifications of input circuit

Item		Specifications	Internal circuit
Туре		DC input	⟨Sink type⟩
No. of input points		8	24)/□
Insulation method		Photo-coupler insulation	24V=
Rated input voltage		12VDC/24VDC	
Rated input curre	nt	Approx. 3mA/approx. 7mA]~√
Working voltage range		DC10.2 to 26.4V(ripple rate within 5%)	HCn*
ON voltage/ON o	urrent	8VDC or more/2mA or more	3.3K 0V(COM)
OFF voltage/OFF current		4VDC or less/1mA or less	
Input resistance		Approx. 3.3kΩ	
Response time OFF-ON		10ms or less(DC24V)	<pre> <source type=""/></pre>
	ON-OFF	10ms or less(DC24V)	+24V
			3.3K HCn*
			* HCn = HC1 ~ HC8

Table 2-23: Electrical specifications of output circuit

Item		Specification	Internal circuit		
Туре		Transistor output	<sink type=""></sink>		
No. of output points		8	24V		
Insulation method		Photo coupler insulation	(Internal power supply)		
Rated load voltage		DG24V			
Rated load voltage rang	e	DC21.6 to 26.4VDC			
Max. current load		0.1A/ 1 point (100%)	GRn*		
Current leak with power	r OFF	0.1mA or less			
Maximum voltage drop v	vith power ON	DC0.9V(TYP.)	1 ** \ <u></u>		
Response time	OFF-ON	2ms or less (hardware response time)			
	ON-OFF	2 ms or less (resistance load) (hardware response time)	Fuse		
Fuse rating		1.0A (each one common) Cannot be exchanged	1.0A		
			•		
			<source type=""/>		
			Fuse +24V 1.0A		
			GRn*		
			↓		

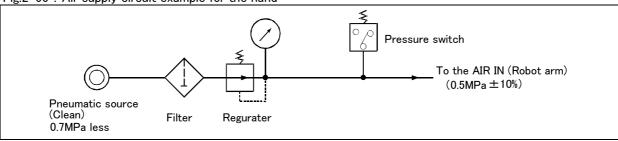
Note) An optional pneumatic hand interface (2A-RZ365/2A-RZ375) is required to use hand output.

2.5.10 Air supply circuit example for the hand

Fig. 2-66 shows an example of pneumatic supply circuitry for the hand.

- (1) Place diodes parallel to the solenoid coil.
- (2) When the factory pneumatic pressure drops, as a result of the hand clamp strength weakening, there can be damage to the work. To prevent it, install a pressure switch to the source of the air as shown in Fig. 2-66 and use the circuit described so that the robot stops when pressure drops. Use a hand with a spring-pressure clamp, or a mechanical lock-type hand, that can be used in cases where the pressure switch becomes damaged.
- (3) The optional hand and solenoid valve are of an oilless type. If they are used, don't use any lubricator.
- (4) Supply clean air to the vacuum generation valve when you use clean type robot.
- (5) If the air supply temperature (primary piping) used for the tool etc. is lower than ambient air temperature, the dew condensation may occur on the coupling or the hose surface.

Fig.2-66: Air supply circuit example for the hand



2.6 Shipping special specifications, options, and maintenance parts

2.6.1 Shipping special specifications

■ What are sipping special specifications?

Shipping special specifications are changed before shipping from the factory. Consequently, it is necessary to confirm the delivery date by the customer.

To make changes to the specifications after shipment, service work must be performed at the work site or the robot must be returned for service.

■ How to order

- (1) Confirm beforehand when the factory special specifications can be shipped, because they may not be immediately available.
- (2) Specified method ····· Specify the part name, model, and robot model type.

(1) Machine cable

Order type: RH-6SDH series...... Fixed type 1S-02UCBL-03 (2m) RH-12SDH/18SDH/20SDH series, RH-3SDHR series...... ● Fixed type 1S-02UCBL-01 (2m)

■ Outline



This cable is exchanged for the machine cable (5 m for fixed type) that was supplied as standard to shorten the distance between the controller and the robot arm.

■ Configuration

Table 2-24: Configuration equipments and types

		Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Qty.	
RI	RH-6SDH series						
	Fixed Set of signal and power cables		1S-02UCBL-03	1set	2.6	2m	
		Motor signal cable	BKO-FA0741H02	(1 cable)	-		
		Motor power cable	BKO-FA0768H02	(1 cable)	-		
RI	H−12SDH/	/18SDH/20SDH series, RH-3SDHR	series				
	Fixed	Set of signal and power cables	1S-02UCBL-01	1set	3.4	2m	
		Motor signal cable	BKO-FA0741H02	(1 cable)	-		
		Motor power cable	BKO-FA0739H02	(1 cable)	-		

Note1) Mass indicates one set.

Note) Standard 5 m (for fixed type) is not attached.

[Caution] Orders made after purchasing a robot are treated as purchases of optional equipment. In this case, the machine cable (5 m for fixed type) that was supplied as standard is not reclaimed.

2.7 Options

■ What are options?

There are a variety of options for the robot designed to make the setting up process easier for customer needs. customer installation is required for the options. Options come in two types: "set options" and "single options".

- 1. Set optionsA combination of single options and parts that together, from a set for serving some purpose.
- 2. Single optionsThat are configured from the fewest number of required units of a part. Please choose customer's purpose additionally.

1	س ۱						
(1)	Mac	hine	cable	AVTA	าดเกท
•			IVIGO		Cabic		131011

(1) Machine Cabi	C CALCITSION		
Order type:	RH-6SDH series	Fixed type	1S- □□ CBL-03
	•	Flexed type	1S- □□ LCBL-03
	RH-12SDH/18SDH/20SDH series, RH-3SDHR series	Fixed type	1S- □□ CBL-01
	•	Flexed type	1S- □□ LCBL-01
	Note) The num	nbers in the b	oxes \square refer the length.

Outline



The distance between the robot controller and the robot arm is extensible by this option. This cable is extended to the machine cable attached as standard. (5m for fix type)

A fixed type and flexible type are available. The fix and flexible types are both configured of the motor signal cable and motor power cable.

■ Configuration

Table 2-25: Configuration equipments and types

Part name		Type ^{Note1)}	Q	ty.	Mass(kg)	Remarks
	Part name	Туре	Fixed	Flexed	Note2)	Remarks
RH-6SDH s	series					
Fixed	Set of signal and power cables	1S- □□ CBL-03	1 set	_	4.3(5m)	5m, 10m, or 15m each
	Motor signal cable	1S- 🗆 🗆 CBL(S)-01	(1 cable)	-	7.6(10m)	
	Motor power cable	1S- □□ CBL(P)-02	(1 cable)	-	11.0(15m)	
Flexed	Set of signal and power cables	1S- □□ LCBL-03	_	1 set	6.2(5m)	5m, 10m, or 15m each
	Motor signal cable	1S- 🗆 🗆 LCBL(S)-01	_	(1 cable)	11.0(10m)	
	Motor power cable	1S- □□ LCBL(P)-02	-	(1 cable)	15.4(15m)	
Nylon cla	amp	NK-14N	-	2 pcs.	-	for motor signal cable
Nylon cla	amp	NK-18N	_	2 pcs.	_	for motor power cable
Silicon r	ubber		_	4 pcs.	_	
RH-12SDH	/18SDH/20SDH series, RH-3SDHI	R series	•			
Fixed	Set of signal and power cables	1S- □□ CBL-01	1 set	_	6.7(5m)	5m, 10m, or 15m each
	Motor signal cable	1S- □□ CBL(S)-01	(1 cable)	-	12.0(10m)	
	Motor power cable	1S- □□ CBL(P)-01	(1 cable)	-	17.3(15m)	
Flexed	Set of signal and power cables	1S- □□ LCBL-01	-	1 set	6.7(5m)	5m, 10m, or 15m each
	Motor signal cable	1S- 🗆 🗆 LCBL(S)-01	_	(1 cable)	12.2()10m	
	Motor power cable	1S- □□ LCBL(P)-01	_	(1 cable)	18.0(15m)	
Nylon clamp		NK-14N	-	2 pcs.	-	for motor signal cable
Nylon cla	amp	NK-18N	-	2 pcs.	-	for motor power cable
Silicon r	ubber		-	4 pcs.	-	

Note1) The numbers in the boxes \square refer the length.

Note2) Mass indicates one set.

Specifications

The specifications for the fixed type cables are the same as those for standard cables. Shows usage conditions for flexed type cables in Table 2–26.

Table 2-26: Conditions for the flexed type cables

Item		Specifications		
Minimum flexed radius		100R or more		
Cableveyor, etc., occupa	tion rate	50% or less		
Maximum movement spe	ed	2000mm/s or less		
Guidance of life count		7.5 million times		
Environmental proof		Oil-proof specification sheath (for silicon grease, cable sliding lubricant type)		
Cable configuration Motor signal cable		ϕ 6.5 x 5, ϕ 8.5 x 1 and ϕ 1.7 x 1		
	Motor power cable	ϕ 6.5 x 10: RH-6SDH ϕ 8.9 x 3 and ϕ 6.5 x 6: RH-12SDH/18SDH/20SDH, RH-3SDHR series		

[Caution] The guidance of life count may greatly differ according to the usage state (items related to Table 2-26 and to the amount of silicon grease applied in the cable conduit.

[Caution] This option can be installed on clean-type, but its cleanliness is not under warranty.

■ Cable configuration

The configuration of the flexible cable is shown in Table 2-27. Refer to this table when selecting the cable bare.

Table 2-27: Cable configuration (Flexed type: RH-6SDH)

Item		Motor signal cable 1S- □□ LCBL(S)-01	Motor power cable 1S− □□ LCBL(P)−02	
No. of cores	AWG#24(0.2mm ²)-4P	AWG#24(0.2mm ²)-7P	AWG#18(0.75mm ²)	AWG#18 (0.75mm ²)-3C
Finish dimensions	Approx. φ6mm	Approx. ϕ 8.5mm	Approx. φ1.7mm	Approx. ϕ 6.5mm
No.of cables used	5 cables	1 cable 1 cable		10 cable
No. in total		7 cables	10 cables	

Note) The square in the cable name indicates the cable length.

Table 2-28: Cable configuration (Flexed type: RH-12SDH/18SDH/20SDH, RH-3SDHR)

Item		Motor signal cable 1S− □□ LCBL(S)–01	Motor pow 1S− □□ LC		
No. of cores	AWG#24(0.2mm ²)-4P AWG#24(0.2mm ²)-7P AWG#18(0.75mm ²)			AWG#16(1.25mm ²)-4C	AWG#18(0.75mm ²)-4C
Finish dimensions	Approx. φ 6mm Approx. φ 8.5mr		Approx. <i>φ</i> 1.7mm	Approx. <i>φ</i> 8.9mm	Approx. <i>φ</i> 6.5mm
No.of cables used	5 cables	1 cable	1 cable	3 cable	6 cable
No. in total	7 cables			9 cab	les

Note) The square in the cable name indicates the cable length.

■ Fixing the flexible cable

- (1) Connect the connector to the robot arm .
- (2) Wind the silicon rubber around the cable at a position 300 to 400 mm from the side of robot arm and extension section as shown in Fig. 2-67, and fix with the nylon clamp to protect the cable from external stress.

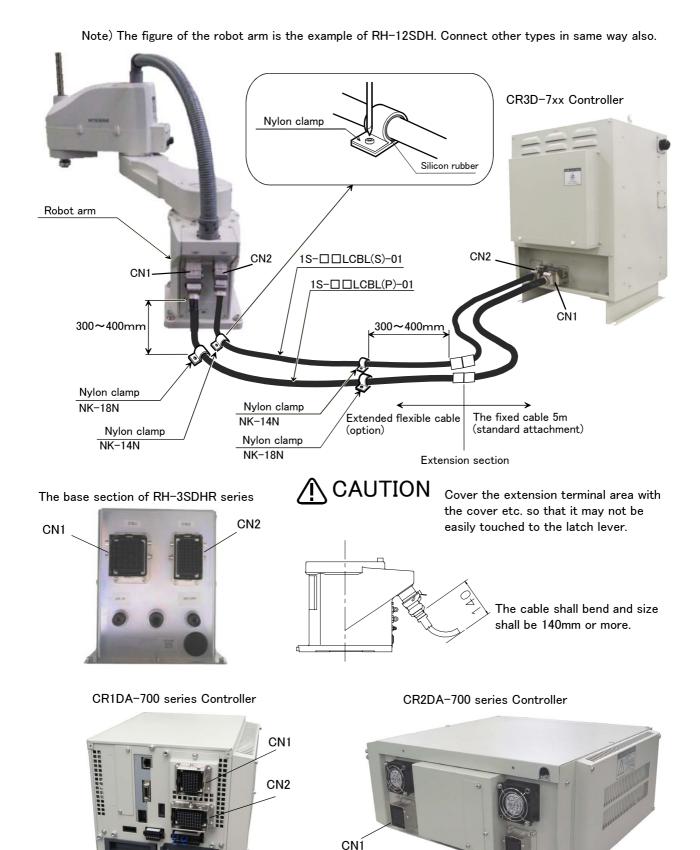


Fig.2-67: Fixing the flexible cable

* The figure is the standard specification.
(The CE marking specification is the same)

CN2

(2) Changing the operating range

■ Order type RH-3SDHR series.......... J1 axis: 1S-DH-05J1

J2 axis: 1S-DH-05J2

■ Outline



The operating range of J1 axis or J2 axis is limited by the robot arm's mechanical stopper and the controller parameters.

If the axis could interfere with the peripheral devices, etc., and the operating range need to be limited, use this.

■ Configuration

Table 2-29: Configuration devices

Part name	Туре	Qty.	Mass(kg)	Remarks
Stopper for changing the operating range	1S-DH-05J1	1 set	0.1	Pin (ϕ 10 x 2) Installation bolt (M4 x 12) : two attachments
	1S-DH-05J2	1 set	0.1	Pin (ϕ 8 x 2) Installation bolt (M4 x 12) : two attachments

■ Specifications

Table 2-30: Specifications

Axis		Standard	Changeable angle Note1)
J1	+/- side	+/- 225°	+/- 90°
J2	+/- side	+/- 225°	+/- 60°

- Note1) Although the J1 axis and the J2 axis can be changed independently (independent per axis), each axis changes plus side /minus side both simultaneously per axis.
 - (1) The changeable angle shown in Table 2-30 indicates the operation range by the software.

 The limit by the mechanical stopper is positioned 3 degrees outward from that angle, so take care when designing the layout.
 - (2) The operating range is changed with robot arm settings (insertion of the pin) and parameter settings. Refer to the separate "Instruction Manual/ROBOT ARM SETUP & MAINTENANCE" or "Instruction Manual/Detailed Explanation of Functions and Operations" for details.
 - (3) If the arm collides with mechanical stopper for operating range change at the automatic operation, replacement of the mechanical stopper is necessary.

(3) Solenoid valve set

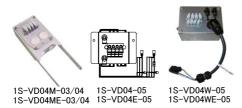
Order type

Four sets: 1S-VD04M-04(Sink type)/1S-VD04ME-04(Source type): RH-6SDH series

Four sets: 1S-VD04M-03(Sink type)/1S-VD04ME-03(Source type): RH-12SDH/18SDH/20SDH series

Four sets: 1S-VD04-05(Sink type)/1S-VD04E-05(Source type): RH-3SDHR series (Standard/Clean specification) Four sets: 1S-VD04W-05(Sink type)/1S-VD04WE-05(Source type): RH-3SDHR series (Waterproof specification)

Outline



The solenoid valve set is an option that is used for controlling toolings when various toolings, such as the hand, are installed at the end of the arm.

This solenoid valve set has a hand output cable attached to the solenoid valve. Also, for easy installation of this electromaagnetic set onto the robot, it comes equipped with a manifold, couplings, silencers (1S-VD04M-04 and 1S-VD04ME-04 only), among other things.

When using the robot arm's hand output signal, the pneumatic hand interface option*1) must be installed on the separate controller.

■ Configuration

Table 2-31: Configuration equipment

Part name	Туре	Q'ty	Mass(kg) Note1)	Remark
RH-6SDH series				
Solenoid valve set (4 sets)	1S-VD04M-04/ 1S-VD04ME-04	Either one pc.	1.0	M4 x 8 Four screws (Installation screws) Hand output junction cable attachment
RH-12SDH/18SDH/20SDH se	ries			
Solenoid valve set (4 sets)	1S-VD04M-03/ 1S-VD04ME-03	Either one pc.	1.8	M4 x 8 Four screws (Installation screws) Hand output junction cable attachment
RH-3SDHR series				
Solenoid valve set (4 sets)	1S-VD04-05/ 1S-VD04E-05	Either one pc.	0.6	For standard/clean specification M5 x 8 Two screws (Installation screws) Fixing nut for T slot : Two nuts 1S-VD04-05 (Sink type), 1S-VD04E-05(Source type)
Solenoid valve set (4 sets)	1S-VD04W-05/ 1S-VD04WE-05	Either one pc.	0.6	For waterproof specification M5 x 8 Two screws (Installation screws) Fixing nut for T slot: Two nuts Cable clamp (for hand output cable fixing) is attached. 1S-VD04W-05 (Sink type), 1S-VD04WE-05(Source type)

Note1) Mass indicates one set.

^{*1)} Use "2A-RZ365" for sink type and use "2A-RZ375" for source type.

■ Specifications

Table 2-32: Valve specifications

Item	Specifications
Number of positions	2
Port	5 Note1)
Valve function	Double solenoid
Operating fluid	Clean air ^{Note2)}
Operating method	Internal pilot method
Effective sectional area (CV value)	0.64mm
Oiling	Unnecessary
Operating pressure range	0.1 ~ 0.7MPa
Response time	22msec or less (at 0.5 MPa)
Max. operating frequency	5Hz
Ambient temperature	-10 to 50 °C (However, there must be no condensation.)

Note1) Couplings of unused solenoid valves must be blocked with plugs. If they are not blocked, supplied air will blow out from the couplings, lowering the air pressure of the solenoid valves being used and making them nonfunctional (recommended plugs: KQ2P-04 plugs made by SMC).

Note2)



CAUTION The air to be provided must be clean, i.e., filtered with a mist separator or air filter. Failing to do so may lead to malfunctions.

Table 2-33: Solenoid specifications

Item	Specifications
Coil rated voltage	DC24V ±10%
Power consumption	0.55W
Voltage protection circuit with power surge protection	Diode

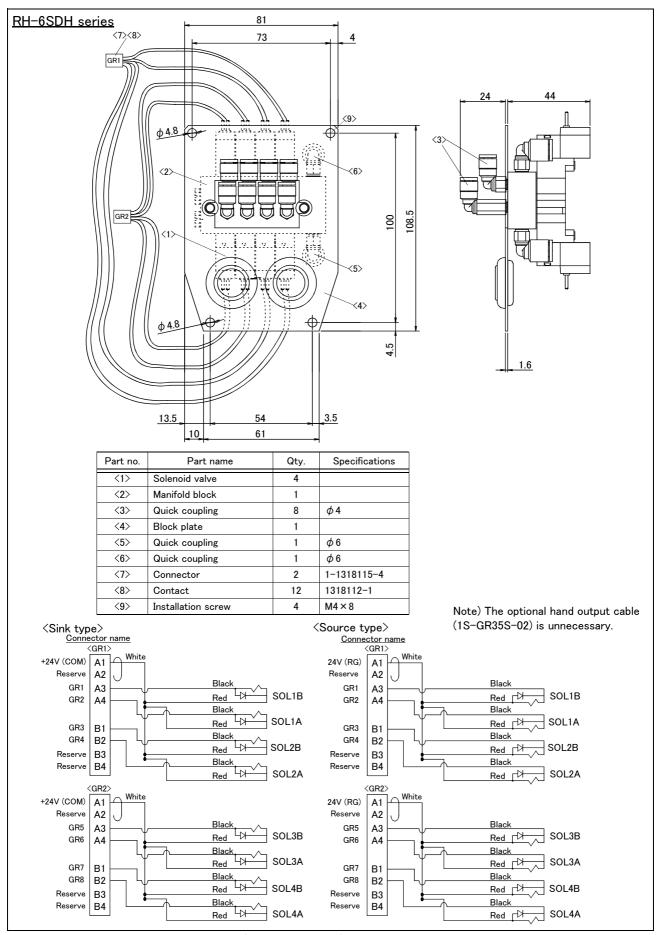


Fig.2-68: Outline dimensional drawing (RH-6SDH series)

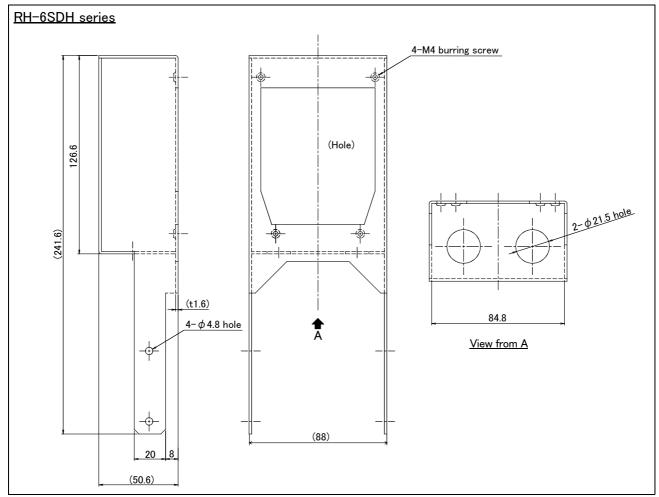


Fig.2-69: Outside dimensions of solenoid valve box (RH-6SDH series)

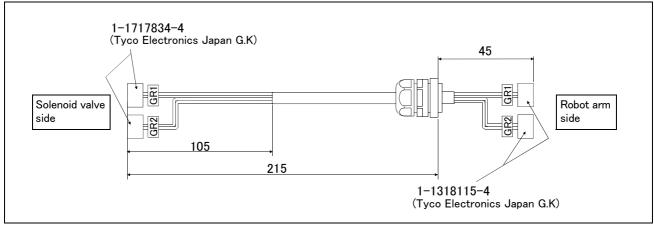


Fig.2-70: Outside dimensions of hand output junction cable (RH-6SDH series)

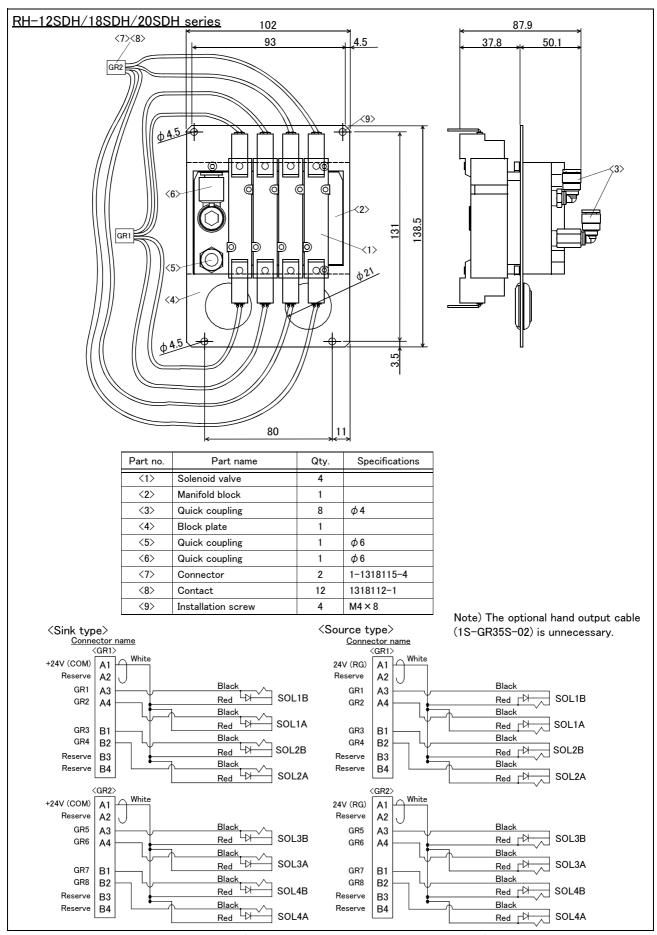
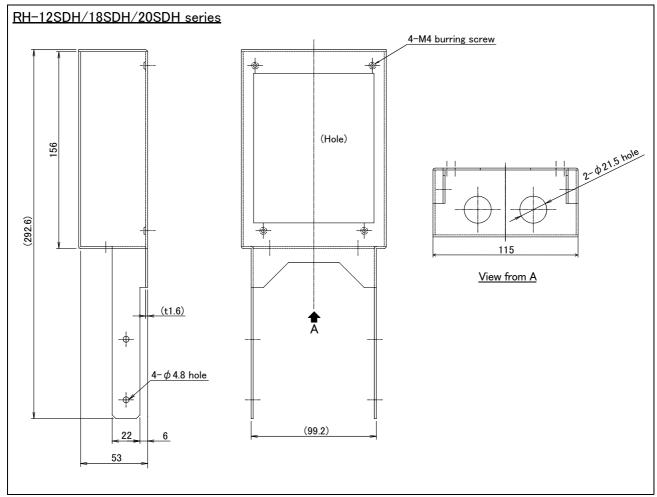


Fig.2-71: Outline dimensional drawing (RH-12SDH/RH-18SDH/RH-20SDH series)



 $Fig. 2-72: Outside \ dimensions \ of \ solenoid \ valve \ box \ (RH-12SDH/18SDH/20SDH \ series)$

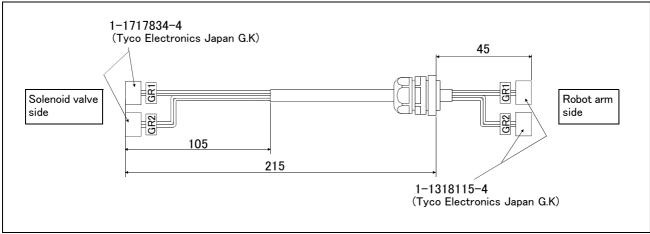


Fig.2-73: Outside dimensions of hand output junction cable (RH-12SDH/18SDH/20SDH series)

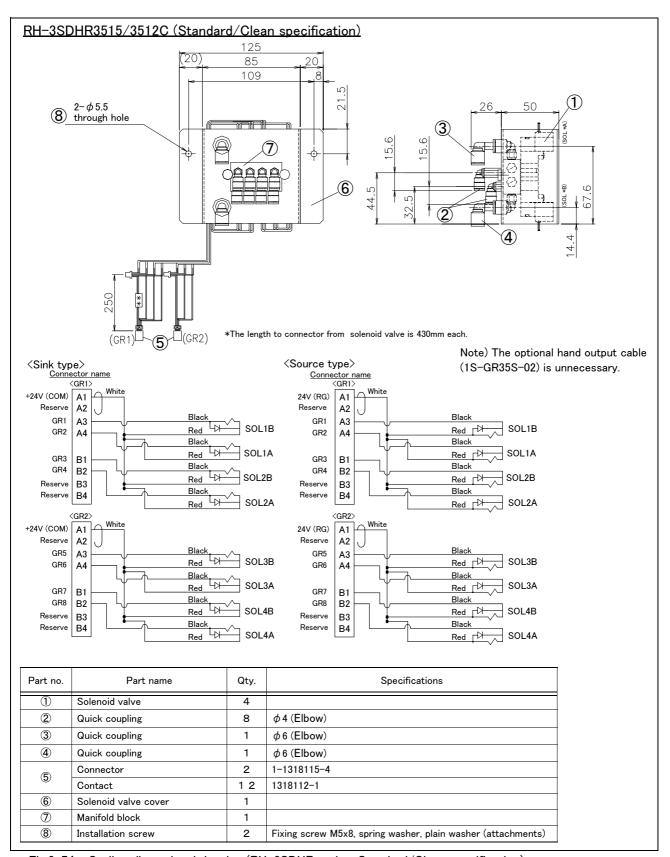


Fig.2-74: Outline dimensional drawing (RH-3SDHR series: Standard/Clean specification)

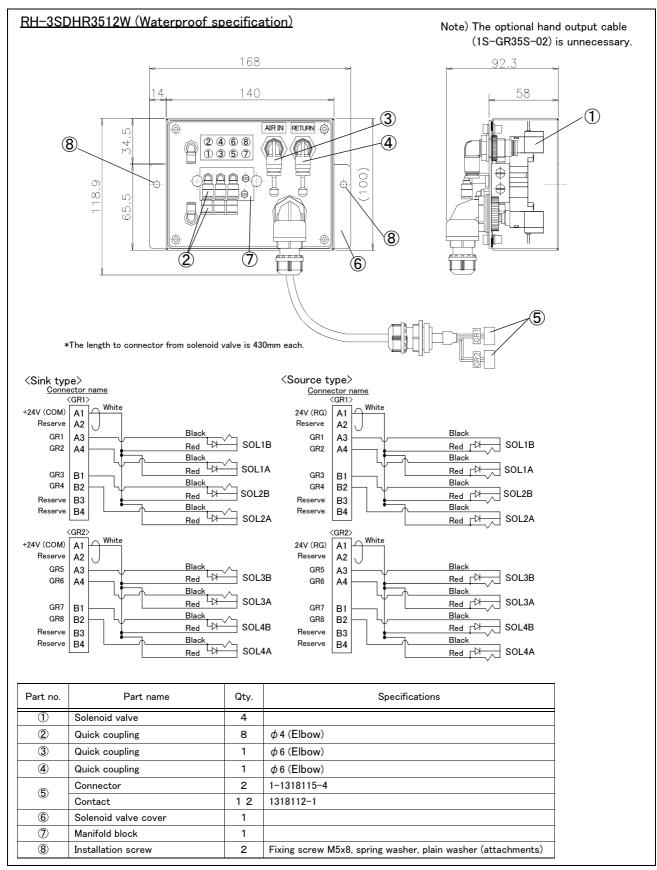


Fig.2-75: Outline dimensional drawing (RH-3SDHR series: Waterproof specification)

(4) Hand input cable

■ Order type: 1S-HC35C-02(RH-6SDH/12SDH/18SDH/20SDH85** series)

1S-HC35C-03(RH-20SDH100** series)
1S-HC00S-01(RH-3SDHR series)

Outline



The hand input cable is used for customer-designed pneumatic hands.

It is necessary to use this to receive the hand's open/close confirmation signals and grasping confirmation signals, at the controller.

One end of the cable connects to the connector for hand input signals, which is in the wrist section of the hand. The other end of the cable connects to the sensor inside the hand customer designed.

■ Configuration

Table 2-34: Configuration equipment

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks	
Hand input cable	1S-HC35C-02	1 cable	0.2	RH-6SDH/12SDH/18SDH/20SDH85** series	
	1S-HC35C-03	1 cable	0.2	RH-20SDH100** series	
	1S-HC00S-01	1 cable	0.1	RH-3SDHR series Three rubber sheets, seven cable clamp attachment	

Note1) Mass indicates one set.

■ Specifications

Table 2-35 : Specifications

	Item Specifications		Remarks				
RH	RH-6SDH/12SDH/18SDH/20SDH85** series						
	Size x cable core AWG#24 $(0.2 \text{mm}^2) \times 12$		One-sided connector, one-sided cable bridging				
	Total length 1300mm (Including the curl section, which is 350mm long)						
RH	RH-20SDH100** series						
	Size x cable core	AWG#24 (0.2mm ²) × 12	One-sided connector, one-sided cable bridging				
	Total length	1450mm (Including the curl section, which is 350mm long)					
RH	-3SDHR series						
	Size x cable core AWG#24 (0.2mm²) × 6		One-sided connector, one-sided cable bridging				
	Total length	1210mm (Including the curl section, which is 350mm long)					

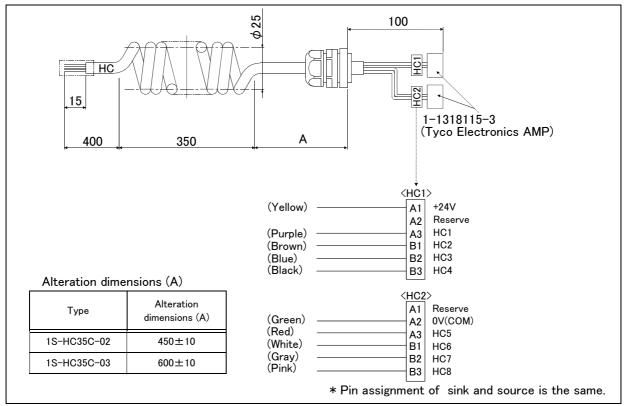


Fig.2-76: Outside dimensional drawing and pin assignment (RH-6SDH/12SDH/18SDH/20SDH series)

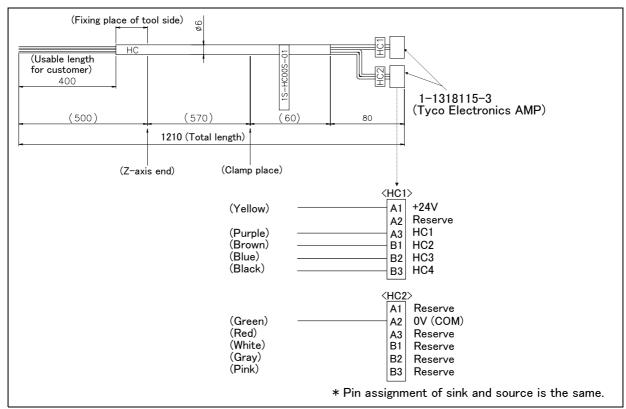


Fig.2-77: Outside dimensional drawing and pin assignment (RH-3SDHR series)

[Caution] This option can be installed on clean-type, but its cleanliness is not under warranty.

(5) Hand output cable

■ Order type: 1S-GR35S-02 (RH-6SDH/12SDH/18SDH/20SDH series, RH-3SDHR series)

■ Outline



The hand output cable (solenoid valve connection cable) is an option that is used when an solenoid valve other than one of the solenoid valve set options, is used. One end of the cable has a connector that connects to the input terminal inside the robot. The other end of the cable is connected.

■ Configuration

Table 2-36: Configuration equipment

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
Hand output cable	1S-GR35S-02	1 cable	0.2	RH-6SDH/12SDH/18SDH/20SDH series, RH-3SDHR series

Note1) Mass indicates one set.

■ Specifications

Table 2-37: Specifications

Item	Specifications	Remarks
Size x Cable core	AWG#24(0.2mm ²) x 12 cores	One side connector and one side cable connection
Total length	450mm	

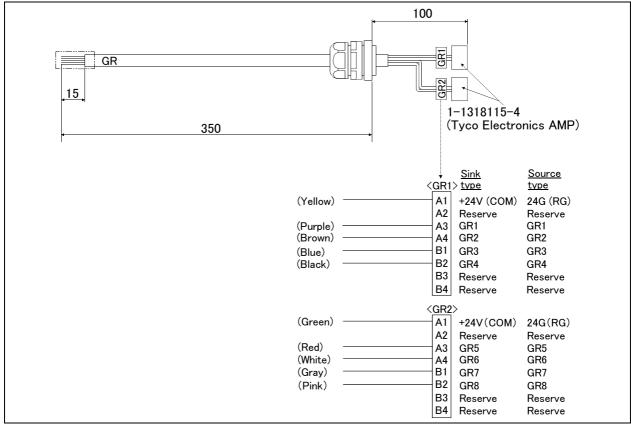


Fig.2-78: Outline dimensional drawing and pin assignment

[Cautions] When you install this optional one in the protection specification type, please seal the fixing section of the robot with silicon rubber by the customer.

[Caution] This option can be installed on clean-type, but its cleanliness is not under warranty.

(6) Hand curl tube

Outline



The hand curl tube is a curl tube for the pneumatic hand.

■ Configuration

Table 2-38 : Configuration equipment

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks		
RH-6SDH series						
Hand curl tube (Four set: 8 pcs.)	1E-ST0408C-300	1 pc.	0.1	Φ4 tube, 8pcs		
RH-12SDH/18SDH/20SDH85** series						
Hand curl tube (Four set: 8 pcs.)	1N-ST0608C	1 pc.	0.4	Φ6 tube, 8pcs		
RH-20SDH100** series						
Hand curl tube (Four set: 8 pcs.)	1N-ST0608C-01	1 pc.	0.4	Φ6 tube, 8pcs		

Note1) Mass indicates one set.

■ Specifications

Table 2-39 : Specifications

	Specifications				
Item	RH-6SDH series	RH-12SDH/18SDH/20SDH series			
Material	Urethane	Urethane			
Size	Outside diameter: Φ4 x Inside diameter Φ2.5	Outside diameter: Φ6 x Inside diameter Φ4			

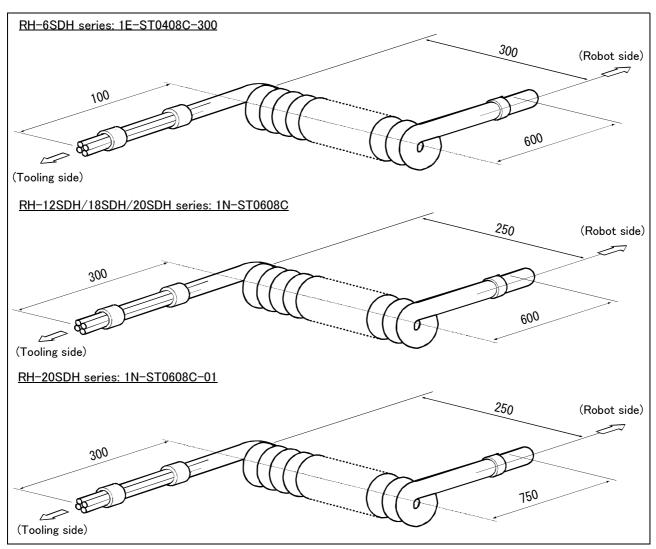


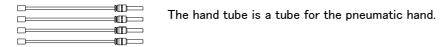
Fig.2-79: Outline dimensional drawing

[Caution] This option can be installed on clean-type, but its cleanliness is not under warranty.

(7) Hand tube

■ Order type: RH-3SDHR series......1E-ST0304S

Outline



■ Configuration

Table 2-40: Configuration equipment

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
RH-3SDHR series				
Hand tube (4 pcs.)	1E-ST0408C-300	1 pc.	1 pc. 0.1 Union (ϕ 4 to ϕ 3): Eight piece at (Four of them is installing at shipp Three rubber sheets, six cable cla attachment	

Note1) Mass indicates one set.

■ Specifications

Table 2-41: Specifications

Item	Specifications	
Material	Urethane	One side is with the tape.
Size	Outside diameter: Φ3 x Inside diameter Φ1.5: 4 pcs.	

* We recommend confirming of the wear and tear and the rub in the cycle of the six months and please prepare as service parts.

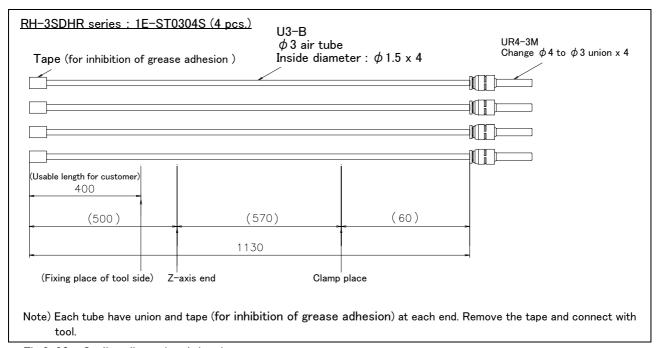


Fig.2-80: Outline dimensional drawing

2.8 About Overhaul

Robots which have been in operation for an extended period of time can suffer from wear and other forms of deterioration. In regard to such robots, we define overhaul as an operation to replace parts running out of specified service life or other parts which have been damaged, so that the robots may be put back in shape for continued use. Overhaul interval for robots presumably varies with their operating conditions and thus with the degree of the equipment's wear and loss of performance. As a rule of thumb, however, it is recommended that overhaul be carried out before the total amount of servo—on time reaches the predetermined levels (24,000 hours for the robot body and 36,000 hours for the controller). (See Fig. 2–81.) For specific information about parts to be replaced and timing of overhaul, contact your local service representative.

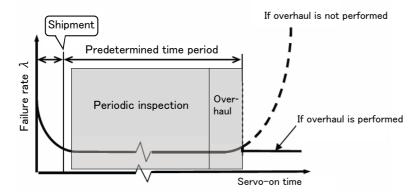


Fig.2-81: Periodic inspection/overhaul periods

2.9 Maintenance parts

The consumable parts used in the robot arm are shown in Table 2–42. Purchase these parts from the designated maker or dealer when required. Some Mitsubishi-designated parts differ from the maker's standard parts. Thus, confirm the part name, robot arm and controller serial No. and purchase the parts from the dealer.

Table 2-42: Consumable part list

No.	Part name	Type Note1)	Usage place	Qty.	Supplier	
1	Grease	SK-1A	Reduction gears of each axis	As needed		
2		Marutenpu PS No.2	Shaft	As needed	Mitsubishi Electric	
3	Lithium battery	A6BAT	Rear section of the base	5		
RH-6S	DH series					
4	Timing belt		J3 axis	1		
5			J4 axis motor side	1	Mitsubishi Electric	
6			J4 axis shaft side	1		
RH-12	SDH/18SDH series					
7	Timing belt		J3 axis	1		
8			J4 axis motor side	1	Mitsubishi Electric	
9			J4 axis shaft side	1		
RH-20	RH-20SDH series					
10	Timing belt		J3 axis	1		
11			J4 axis motor side	1	Mitsubishi Electric	
12			J4 axis shaft side	1		

No.	Part name	Type Note1)	Usage place	Qty.	Supplier			
RH-3S	RH-3SDHR series							
13	Timing belt		J1 axis	1				
14			J2 axis	1				
15			J3 axis	1	Mitsubishi Electric			
16			J4 axis motor side	1				
17			J4 axis shaft side	1				

Note1) Confirm the robot arm serial No., and contact the dealer or service branch of Mitsubishi Electric Co., for the type.

Table 2-43: Consumable part (packing) list

No.	2-43 : Consumable part	Details of configuration		U	Isage place	1
	part name	Packing name	Qty.	Cover name	Qty.	Sticking side
RH-69	SDH standard specification				"	
1	PackingC	PackingC		J1 cover	1	Robot arm side
	Part Cord : K07S16433901		1	No.2 arm cover U	2	Cover side
2	Solenoid valve box packing Part Cord: K07S24334001	Solenoid valve box packing	1	Solenoid valve box	1	Cover side
RH-69	SDH clean or oil mist specifica	tion				
3	PackingA	PackingA		J1 cover	1	Robot arm side
	Part Cord : K07S24409801			No.2 arm cover U	2	Cover side
			1	Bottom plate	1	Cover side
				CON plate G	1	Robot arm side
				No.2 arm cover L	1	Cover side
4	No.2 arm cover U packing Part Cord : K07S24329601	No.2 arm cover U packing	1	No.2 arm cover U (CBL bracket F)	1	Cover side
5	No.2 arm cover U packing B Part Cord: K07S24336601	No.2 arm cover U packing B	1	No.2 arm cover U (CON plate F)	1	Cover side
6	Base packing top Part Cord: K07S24336501	Base packing top	1		1	Robot arm side
7	Base packing bottom	Base packing bottom A	1	CONBOX cover	1	Robot arm side
	Part Cord : K07S24333951	Base packing bottom B	1		1	Robot arm side
8	Battery bracket packing Part Cord: K07S24412401	Battery bracket packing	1	Battery cover	1	Cover side
9	PackingB Part Cord: K07S24417001	PackingB	1	Base cover	1	Robot arm side
10	Solenoid valve box packing Part Cord: K07S24334001	Solenoid valve box packing	1	Solenoid valve box	1	Cover side
RH-12	2SDH /18SDH/20SDH standar	d specification			-	
11	PackingC	PackingC	1	J1 cover	1	Robot arm side
	Part Cord : K07S16433901		'	No.2 arm cover U	3	Cover side
12	Solenoid valve box packing Part Cord: K07S24333501	Solenoid valve box packing	1	Solenoid valve box	1	Cover side
RH-12	2SDH /18SDH/20SDH clean o	r oil mist specification				
13	PackingA	PackingA		J1 cover	1	Robot arm side
	Part Cord : K07S24409801			No.2 arm cover U	2	Cover side
			1	Bottom plate	2	Cover side
				CON plate G	1	Robot arm side
				No.2 arm cover L	2	Cover side
14	No.2 arm cover U packing Part Cord: K07S24329701	No.2 arm cover U packing	1	No.2 arm cover U (CBL bracket F)	1	Cover side
15	No.2 arm cover U packing B Part Cord : K07S24336701	No.2 arm cover U packing B	1	No.2 arm cover U (CON plate F)	1	Cover side
16	Base packing top Part Cord: K07S24333101	Base packing top	1		1	Robot arm side
17	Base packing bottom	Base packing bottom A	1	CONBOX cover	1	Robot arm side
	Part Cord : K07S24333251	Base packing bottom A	1		1	Robot arm side
18	Battery bracket packing Part Cord : K07S24412401	Battery bracket packing	1	Battery cover	1	Cover side
19	PackingB Part Cord : K07S24417001	PackingB	1	Base cover	1	Robot arm side
20	Solenoid valve box packing Part Cord : K07S24333501	Solenoid valve box packing	1	Solenoid valve box	1	Cover side

3 Controller

3.1 Standard specifications

3.1.1 Standard specifications

Table 3-1: Standard specifications of controller (CR1DA-700 series)

	<u>'</u>		, , ,	•
	Item	Unit	Specification	Remarks
Type ^{Note1)}			CR1DA-700 series	RH-6SDH series: CR1DA-761
Number of	control axis		Simultaneously 4	
Memory	Programmed positions and No.	point	13,000	
capacity	of steps	step	26,000	
	Number of programs		256	
Robot lang	uage		MELFA-BASIC V	
			or Note 2)	
			MELFA-BASIC IV Note2)	
Teaching n	1		Pose teaching method ,MDI method Note3)	
External	input and output	point	0/0 ^{Note4)}	Max. 256/256 by option
input and	Dedicated input/output	point	Assigned with general-purpose input/output	
output	Special stop input	point	1	
	Hand open/close input/output	point	Input 8 point/Output 0 point	Up to 8 output points can be added as an option Note5)
	Emergency stop input	point	1	Dual line, normal close
	Door switch input	point	1	Dual line, normal close
	Enabling device input	point	1	Dual line, normal close
	Mode output	point	1	Dual line
	Robot error output	point	1	Dual line
	Addition axis synchronization	point	1	Dual line
Interface	RS-232C	port	1	For expansion such as the personal cpmputer, Vision sensor
	Ethernet	port	1: For T/B, 1: For customers	10BASE-T/100BASE-Tx
	USB		1	Ver. 2.0 Only device function
	Hand dedicated slot	slot	1	Dedicated for pneumatic hand interface
	Option slot	slot	1	
	Additional axis interface	Channel	1	SSCNET III
	Serial encoder interface	Channel	1	For encoder cable connection
Power	Input voltage range	V	1-phase, AC180 to 253	Note6)
source	Power capacity	KVA	1.0	Does not include rush current Note7)
Outline dimensions ^{Note8)}		mm	CR1DA-700 (Standard specification): 240(W)x290(D)x200(H) CR1DA-700 (CE marking specification): 270(W)x290(D)x200(H)	Excluding protrusions
Mass		kg(lb)	Approx. 9(19.8)	
Constructi	on		Self-contained floor type Opened type	IP20 Note9)
Operating temperature range		°C	0 to 40	
Ambient hu	umidity	%RH	45 to 85	Without dew drops
Grounding		Ω	100 or less	D class grounding earth ^{Note10)}
Paint color			Light gray	Munsell 0.08GY7.64/0.81

Note1) The RH-6SD series controller of CE marking specification

- *"-S12" specification: the controller is CR1DA-700-S12 series.
 *"-S312" specification: the controller is CR2DA-700-S312 series.
- Note2) The program of MELFA-BASIC IV can be used by MELFA-BASIC V, if program is converted by RT ToolBox2 (option).
- Note3) Pose teaching method: The method to register the current position of the robot arm.
- MDI method: The method to register by inputting the numerical value Immediate. Note4) The 32/32 points can be use for S312 specification only. (One parallel I/O interface(2D-TZ378) is installed at factory shipping)
- Note5) It is when an pneumatic hand interface (2A-RZ365/2A-RZ375) is installed.
- Note6) Please use the controller with an input power supply voltage fluctuation rate of 10% or less.
- Note7) The power capacity is the rating value for normal operation. The power capacity does not include the rush current when the power is turned ON. The power capacity is a guideline and the actual operation is affected by the input power voltage. The short circuit breaker should use the following.
 - *Operate by the current leakage under the commercial frequency domain (50-60Hz). If sensitive to the high frequency ingredient, it will become the cause in which below the maximum leak current value carries out the trip.
- Note8) Refer to Page 133, "3.3 Outside dimensions/Installation dimensions" for details.
- Note9) This controller is a general environment specification. If the controller used in the clean environment, install to the place which does not have effect to cleanness.
- Note10) The robot must be grounded by the customer.

Table 3-2: Standard specifications of controller (CR2DA-700 series)

Table 0 2		Unit	troller (CR2DA-700 series)	Pomorko
	Item		Specification	Remarks
Туре			CR2DA-761/741/751	RH-6SDH series: CR2DA-761 ^{Note1)} RH-12SDH series: CR2DA-741 RH-18SDH/RH20SDH series : CR2DA-751 RH-3SDHR series: CR2DA-781
Number of	control axis		Simultaneously 4	
Memory capacity	Programmed positions and No. of steps	point step	13,000 26,000	
	Number of programs	ОСОР	256	
Robot lang	<u> </u>		MELFA-BASIC V or MELFA-BASIC IV ^{Note2)}	
Teaching method			Pose teaching method ,MDI method ^{Note3)}	
External	input and output	point	0/0 ^{Note4)}	Max. 256/256 by option
input and	Dedicated input/output	point	Assigned with general-purpose input/output	1
output	Special stop input	point	1	
	Hand open/close input/output	point	Input 8 point/Output 0 point	Up to 8 output points can be added as an option Note5)
	Emergency stop input	point	1	Dual line, normal close
	Door switch input	point	1	Dual line, normal close
	Enabling device input	point	1	Dual line, normal close
	Mode output	point	1	Dual line
	Robot error output	point	1	Dual line
	Addition axis synchronization	point	1	Dual line
Interface	RS-232C	port	1	For expansion such as the personal cpmputer, Vision sensor
	Ethernet	port	1: For T/B, 1: For customers	10BASE-T/100BASE-Tx
	USB		1	Ver. 2.0 Only device function
	Hand dedicated slot	slot	1	Dedicated for pneumatic hand interface
	Option slot	slot	3	
	Additional axis interface	Channel	1	SSCNET III
	Serial encoder interface	Channel	1	For encoder cable connection
Power	Input voltage range	V	1-phase, AC180 to 253	Note6)
source	Power capacity	KVA	2.0	Does not include rush current Note7)
Outline dimensions Note8)		mm	467(W) x 400(D) x 200(H)	Excluding protrusions
Mass		kg(lb)	Approx. 21(46)	
Construction		1	Self-contained floor type, Opened type	IP20 Note9)
Operating temperature range		deg.	0 to 40	
Ambient humidity		%RH	45 to 85	Without dew drops
Grounding		Ω	100 or less	D class grounding earth ^{Note10)}
Paint color			Light gray	Munsell 0.08GY7.64/0.81

Note1) This controller is the standard of CE specification.

Note2) The program of MELFA-BASIC IV can be used by MELFA-BASIC V, if program is converted by RT ToolBox2 (option).

Note3) Pose teaching method: The method to register the current position of the robot arm.

MDI method: The method to register by inputting the numerical value Immediate.

Note4) The 32/32 points can be use for S312 specification only. (One parallel I/O interface(2D-TZ378) is installed at factory shipping)

Note5) It is when an pneumatic hand interface (2A-RZ365/2A-RZ375) is installed.

Note6) Please use the controller with an input power supply voltage fluctuation rate of 10% or less.

Note7) The power capacity is the rating value for normal operation. The power capacity does not include the rush current when the power is turned ON. The power capacity is a guideline and the actual operation is affected by the input power voltage. The power consumption in the specific operation pattern with the RH-12SDH/18SDH/20SDH series and RH-3SDHR series is approx. 0.6kw.

Note8) Refer to Page 133, "3.3 Outside dimensions/Installation dimensions" for details.

Note9) This controller is a general environment specification. For use in an oil-mist environment or in an environment with excess dust, use the CR3D-7**M controller instead.

RH-6SDH series: Please contact to dealer, if you need the controller of protection specification of CE specification. Note 10) The robot must be grounded by the customer.

Table 3-3: Standard specification of controller (CR3D-700 series)

Item		Unit	Specification	Remarks
Туре			CR3D-741M/CR3D-751M	RH-12SDH-SM series:CR3D-741M RH-18SDH-SM/20SDH-SM series :CR3D-751M ^{Note1)}
Number of control axis			Simultaneously 4	
Memory	Programmed positions and No.	point	13,000	
capacity	of steps	step	26,000	
	Number of programs		256	
Robot language			MELFA-BASIC V	
			or MELFA-BASIC IV ^{Note2)}	
Teaching m	nethod		Pose teaching method ,MDI method ^{Note3)}	
External	input and output	point	0/0 Note4)	Max. 256/256 by option
input and	Dedicated input/output	point	Assigned with general-purpose input/output	
output	Special stop input	point	1	
	Hand open/close input/output	point	Input 8 point/Output 0 point	Up to 8 output points can be added as an option Note5)
	Emergency stop input	point	1	Dual line, normal close
	Door switch input	point	1	Dual line, normal close
	Enabling device input	point	1	Dual line, normal close
	Mode output	point	1	Dual line
	Robot error output	point	1	Dual line
	Addition axis synchronization	point	1	Dual line
Interface	RS-232	port	1	For expansion such as the personal cpmputer, Vision sensor
	Ethernet	port	1: For T/B, 1: For customers	10BASE-T/100BASE-Tx
	USB		1	Ver. 2.0 Only device function
	Hand dedicated slot	slot	1	Dedicated for pneumatic hand interface
	Option slot	slot	3	
	Additional axis interface	Channel	1	SSCNET III
	Serial encoder interface	Channel	1	For encoder cable connection
Power source	Input voltage range	V	3-phase, AC180 to 253 for standard 3-phase, AC360 to 480 for CE Marking	Note6)
	Power capacity	KVA	2.0	Does not include rush current Note7) Note8)
Outline dimensions		mm	450(W)x440(D)x625(H)	Excluding protrusions Note9)
Mass		kg(lb)	Approx. 60(132)	
Construction			Self-contained floor type, Closed type (IP54)	Note10)
Operating temperature range		deg.	0 to 40	
Ambient humidity		%RH	45 to 85	Without dew drops
Grounding		Ω	100 or less	D class grounding earth ^{Note11)}
Paint color			Light gray	Munsell 0.08GY7.64/0.81

Note1) Please contact to dealer, if you need the controller of CE specification.

Note2) The program of MELFA-BASIC IV can be used by MELFA-BASIC V, if program is converted by RT ToolBox2 (option).

Note3) Pose teaching method: The method to register the current position of the robot arm. MDI method: The method to register by inputting the numerical value Immediate.

Note4) The 32/32 points can be use for S312 and S12 specification only. (One parallel I/O interface(2D-TZ378) is installed at factory shipping)

Note5) It is when an proveumatic hand interface (2A-RZ365/2A-RZ375) is installed.

Note6) Please use the controller with an input power supply voltage fluctuation rate of 10% or less.

Note7) The power capacity is the rating value for normal operation. The power capacity does not include the rush current when the power is turned ON. The power capacity is a guideline and the actual operation is affected by the input power voltage. The power consumption in the specific operation pattern with the RH-12SDH/18SDH/20SDH series is approx. 0.64kW.

Note8) If the earth leakage breaker is installed in the primary side power supply circuit of the controller, please select the earth leakage breaker of the specification of the amperage rating 20A and 10mA of sensed current. (The leak current of the controller is set to about 7.5mA)

The short circuit breaker should use the following.

*Operate by the current leakage under the commercial frequency domain (50-60Hz).

If sensitive to the high frequency ingredient, it will become the cause in which below the maximum leak current value carries out the trip.

Note9) Becomes 615(H) at the caster specification.

Note10) Take care so that the oil etc. may not be sprinkled directly.

Note11) The robot must be grounded by the customer.

3.1.2 Protection specifications and operating supply

A protection method complying with the IEC Standard IP20(Opened type), IP54(Closed type) is adopted for the controller.

The IEC IP symbols refer only to the degree of protection between the solid and the fluids, and don't indicated that any special protection has been constructed for the prevention against oil and water.

[Information]

• The IEC IP20

It indicates the protective structure that prevents an iron ball $12^{+0.05}_{0}$ mm diameter, which is being pressed with the power of 3.1 kg ± 10%, from going through the opening in the outer sheath of the supplied equipment.

• The IEC IP54

The IEC IP54 standard refers to protection structure designed to prevent any harmful effects by fresh water scattering vertically onto the testing equipment in a radius of 180 degrees from a distance of 300 to 500 mm, with 10 ± 0.5 liters of water every minute, at a water pressure of 80 to $100 \mathrm{kPa}$, covering the entire area of the robot with the exception of the installation section at 1 m per minute, for a total of 5 minutes or more.

Refer to the section Page 221, "6.2 Working environment" for details on the working environment.



If the robot is used in an oil mist environment, use the optional contorller protection box (CR1D-MB) to protect the CR1DA-700 series controller from the oil mist environment for RH-6SDH series. (Only for the controller of standard specification)

3.2 Names of each part

< CR1DA-700 series >

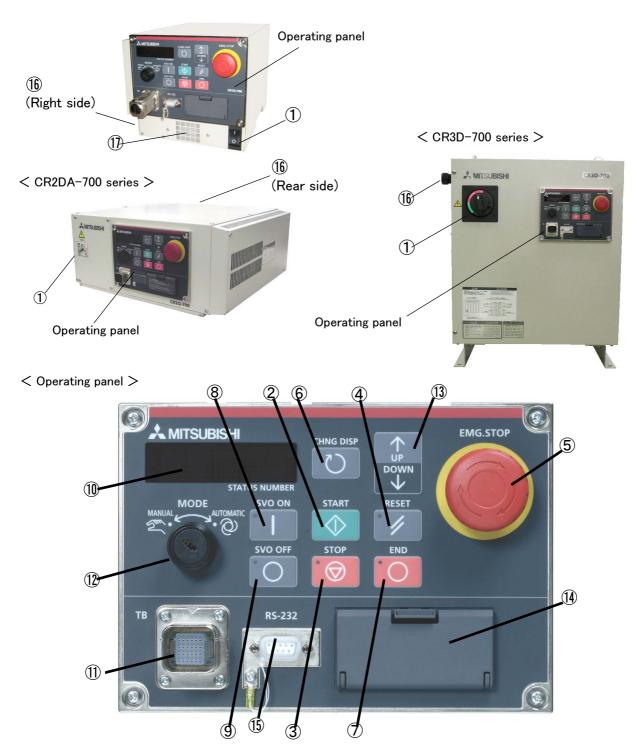


Fig.3-1: Names of controller parts

1 POWER switch Note 1,This turns the control power ON/OFF. (With earth leakage breaker function)
② START button
③ STOP button
4 RESET button
⑤ Emergency stop switchThis stops the robot in an emergency state. The servo turns OFF.

CHNGDISP button	This changes the details displayed on the display panel in the order of "Override" \to "Program No." \to "Line No.".			
7 END button	This stops the program being executed at the last line or END statement.			
8 SVO.ON button	.This turns ON the servo power. (The servo turns ON.)			
9 SVO.OFF button	This turns OFF the servo power. (The servo turns OFF.)			
10 STATUS NUMBER				
(display panel)	The alarm No., program No., override value (%), etc., are displayed.			
① T/B connection connector	This is a dedicated connector for connecting the T/B . When not using T/B , connect the attached dummy connector.			
12 MODE key switch	This changes the robot's operation mode.			
	operations from the controller or external equipment are valid. Operations for which the operation mode must be at the external device or T/B are not possible. It is necessary to set the parameter for the rights of operation to connection between the operation panel and external equipment. For details, please refer to "INSTRUCTION MANUAL/Detailed explanations of functions and operations" of the separate volume.			
MANUAL	When the T/B is valid, only operations from the T/B are valid. Operations for			
	which the operation mode must be at the external device or controller are not possible.			
(13) UP/DOWN button	This scrolls up or down the details displayed on the "STATUS. NUMBER" display panel.			
14 Interface cover	.USB interface and battery are mounted.			
(15) RS-232 connector	.This is an RS-232C specification connector for connecting the personal computer.			
(16) Terminal cover (CR1DA-700 series)				
	.The terminal which connects the primary power cable.			
Cable lead-in port (CR2D-700 series)				
	.Draw in the primary power cable.			
Power cable clamp(CR3D-70	0 series)			
	.Fix the primary power cable.			
① Filter (intake vent)	.The intake vent of the recirculating air for internal cooling.			

Note 1) The operation lock of the power switch (CR1DA/CR2DA/CR3D-700 series controller)

The power switch has the operation lock function. It is the mechanism in which the mistaken power supply ON is prevented with the padlock etc. at the time of the maintenance of the robot system etc. Prepare lock devices, such as the padlock, by the customer.

The usage of lock function is shown in the Page 125, "(1) Padlock specification".

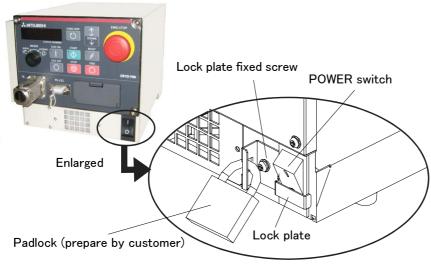


Use the network equipments (personal computer, USB hub, LAN hub, etc) confirmed by manufacturer. The thing unsuitable for the FA environment (related with conformity, temperature or noise) exists in the equipments connected to USB, RS-232 or LAN. When using network equipment, measures against the noise, such as measures against EMI and the addition of the ferrite core, may be necessary. Please fully confirm the operation by customer. Guarantee and maintenance of the equipment on the market (usual office automation equipment) cannot be performed.

(1) Padlock specification

If the robot is not used, the power switch can be locked with the padlock so that power supply ON cannot be done easily. The specification is shown in the following.

< CR1DA-700 series > CE marking specification



<The operation method>

- (1) The lock method (power supply OFF)
- 1) Turn OFF the power switch.
- 2) Loosen the lock plate fixing screw and make it slide upwards (cover the power switch). Tighten the fixing screw certainly in that position.
- 3) Install the padlock (customer preparation) to the hole of the lock plate, and lock it. The lock is completion

(2) The release method (power supply ON)

- 1) Remove the padlock.
- 2) Loosen the lock plate fixing screw and make it slide downward (position which does not cover the power switch). Tighten the fixing screw certainly in that position.

Lock release is completion.

The lock device which can be used

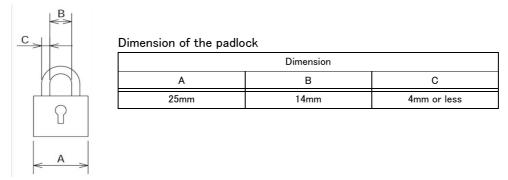
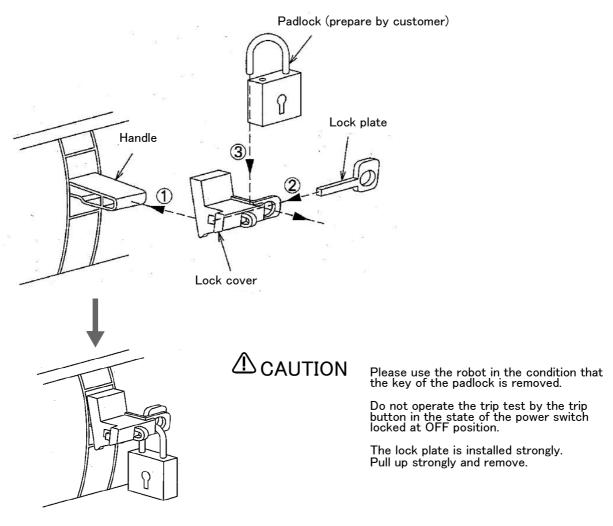


Fig.3-2: Operation lock of the power switch (CR1DA-700 series)

< CR2DA-700 series >



The lock device which can be used

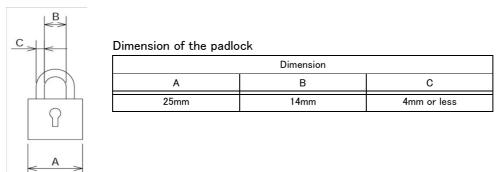
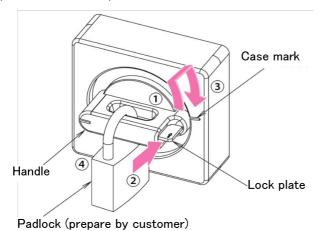


Fig.3-3 : Operation lock of the power switch(CR2DA-700 series)

< CR3D-700 series >



Usage of lock function

- 1 Turn the handle to the reset direction until the mark of the lock plate and the case mark is in match.
- 2 Push in the lock plate.
- 3 Return the handle to the OFF position, with pushing the lock plate.
- 4 Lock the handle with the padlock.

The lock device which can be used



Dimension of the padlock

Dimension (mm)						
Α	В	С				
35(0.11)	19	5				
40(0.13)	22 or 23	5.5				

The maximum size of "C" which can be installed is 8mm.

Fig.3-4: Operation lock of the power switch(CR3D-700)

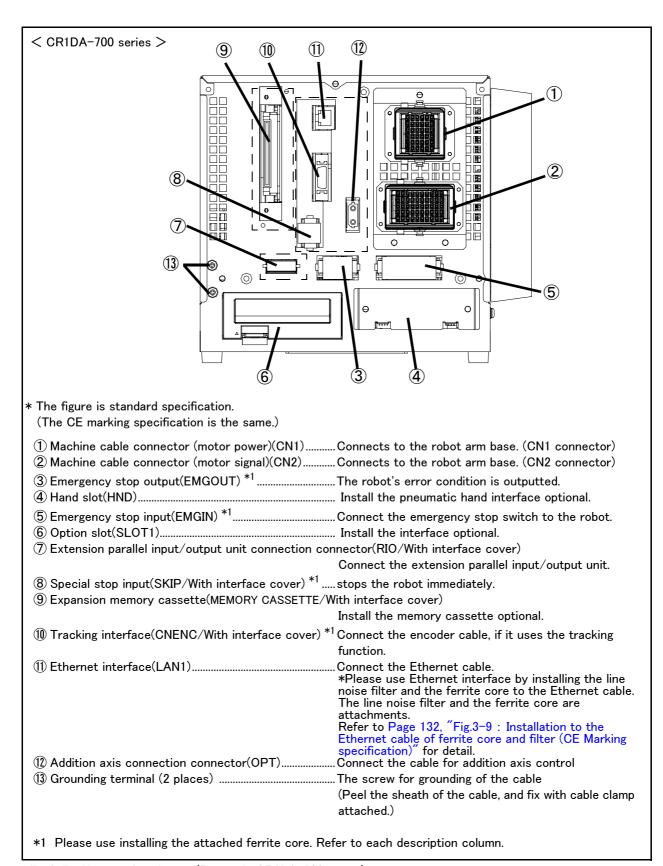


Fig.3-5: Names of each part (Rear side CR1DA-700 series)

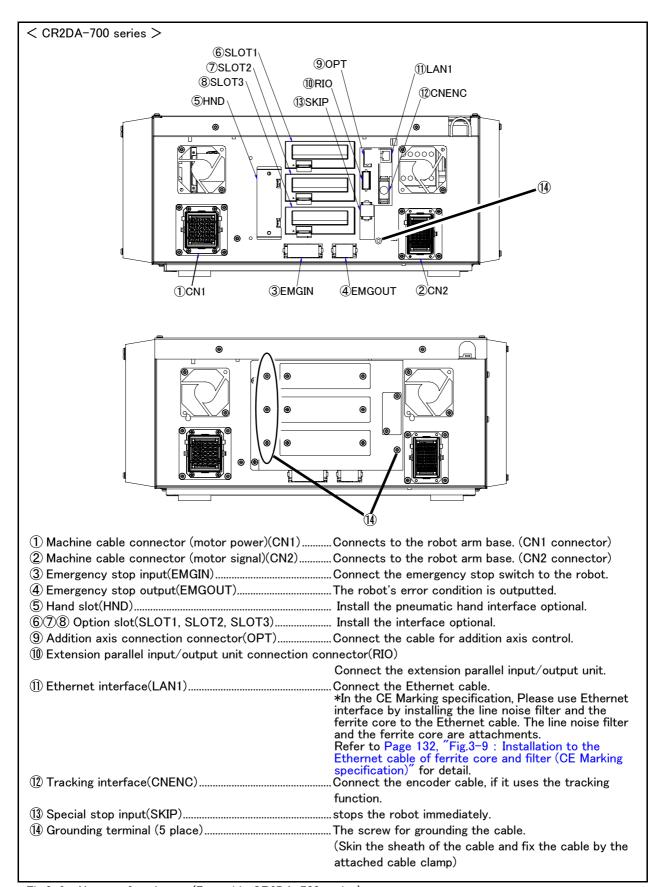


Fig.3-6: Names of each part (Rear side CR2DA-700 series)

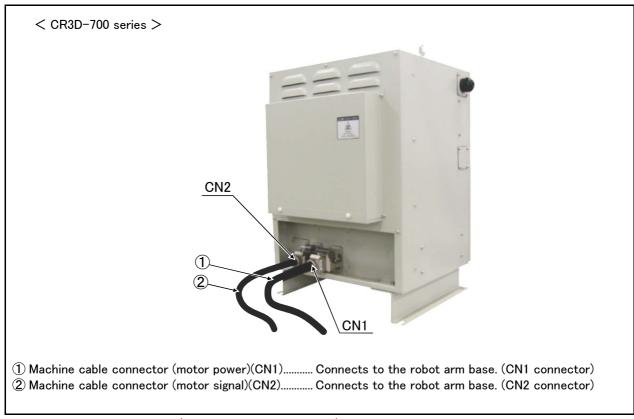


Fig.3-7: Names of each part (Rear side CR3D-700 series)

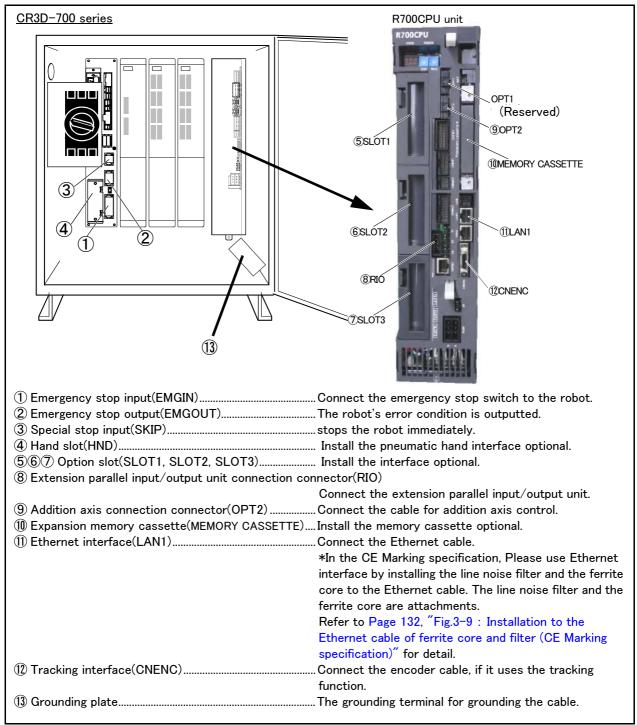


Fig.3-8: Names of each part (interior CR3D-700 series)

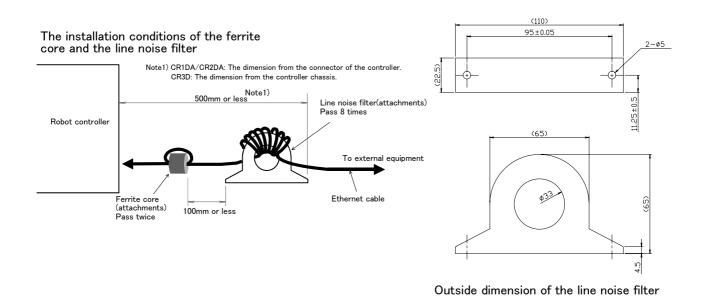


Fig.3-9: Installation to the Ethernet cable of ferrite core and filter (CE Marking specification)

3.3 Outside dimensions/Installation dimensions

3.3.1 Outside dimensions

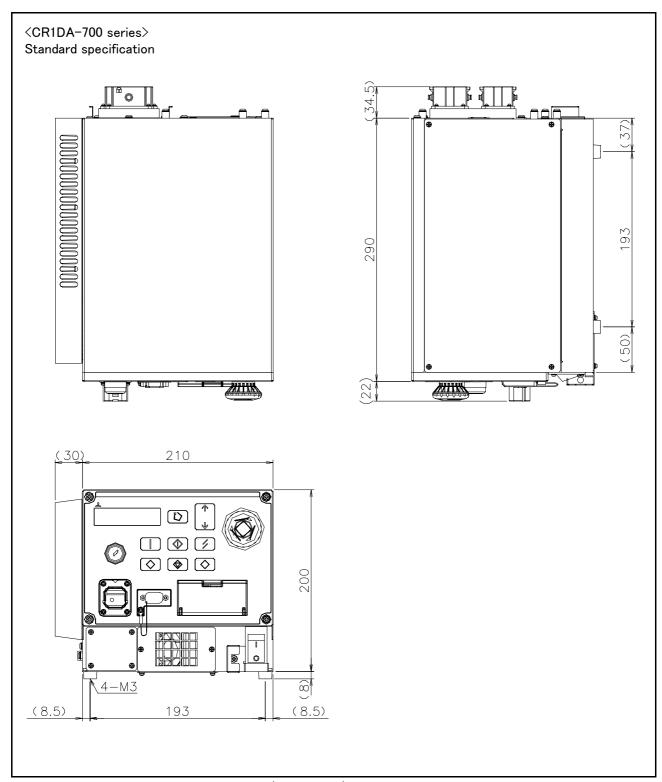
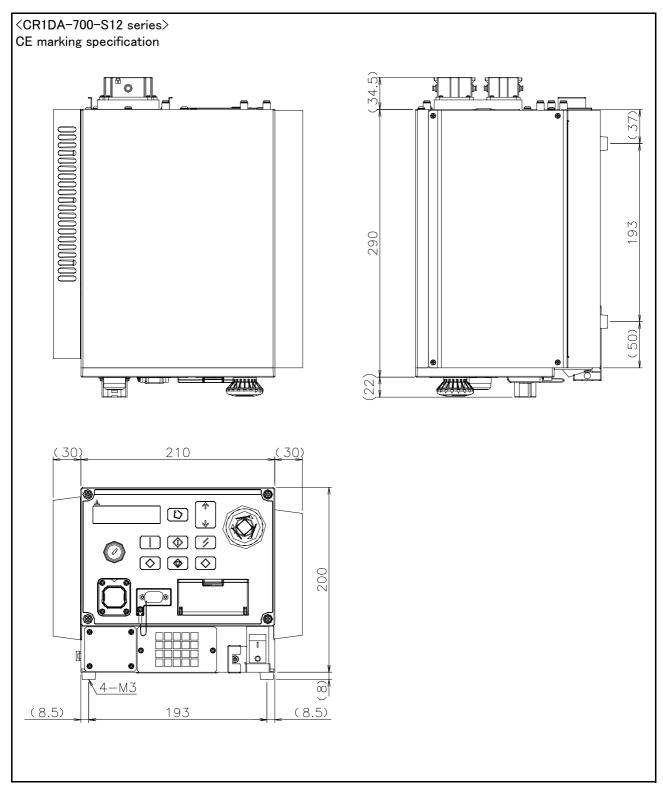


Fig.3-10: Outside dimensions of controller (CR1DA-700)



 $Fig. 3-11: Outside \ dimensions \ of \ controller \ (CR1DA-700-S12 \ series)$

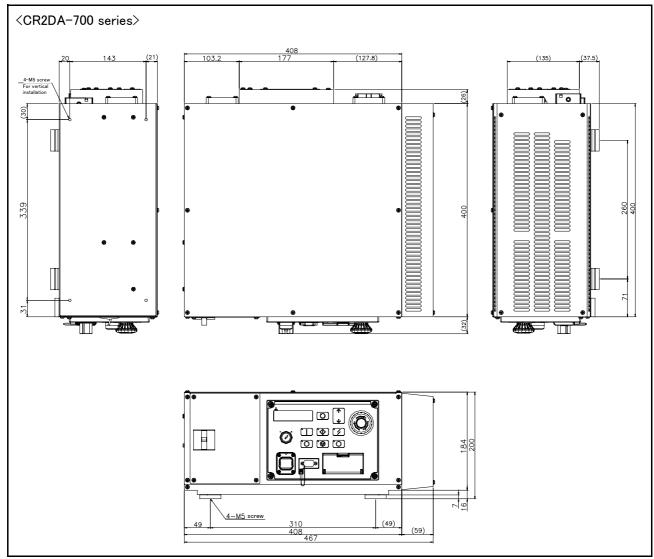


Fig.3-12: Outside dimensions of controller(CR2DA-700)

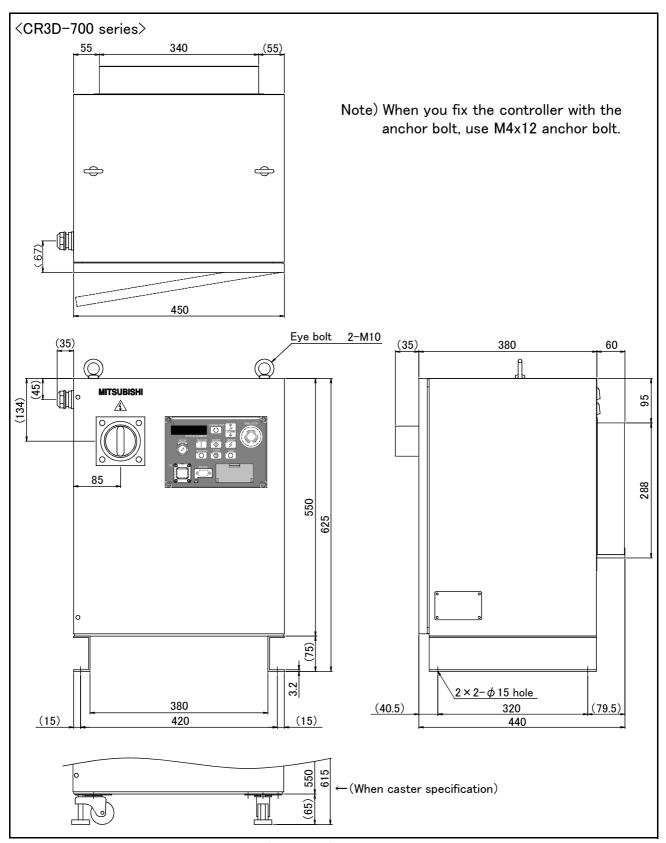


Fig.3-13: Outside dimensions of controller(CR3D-700)

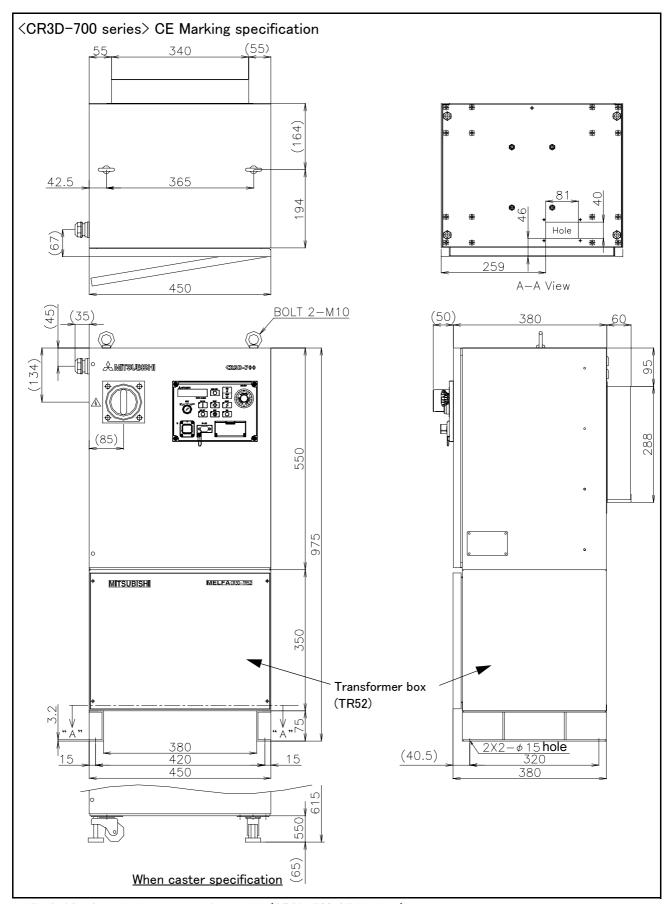


Fig.3-14: Outside dimensions of controller(CR3D-700 CE Marking)

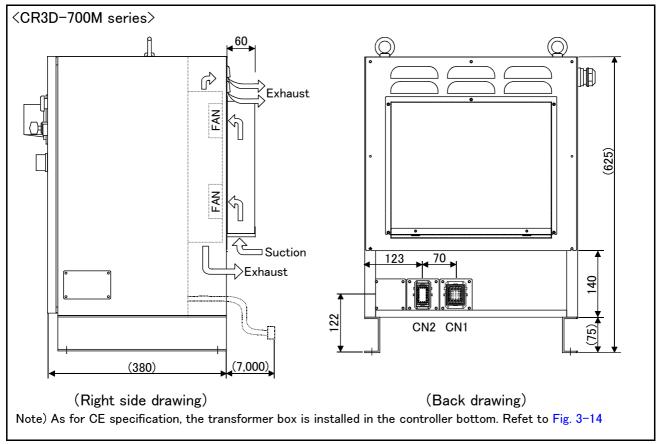


Fig.3-15: Outside dimensions of controller (CR3D-700M Supplement)

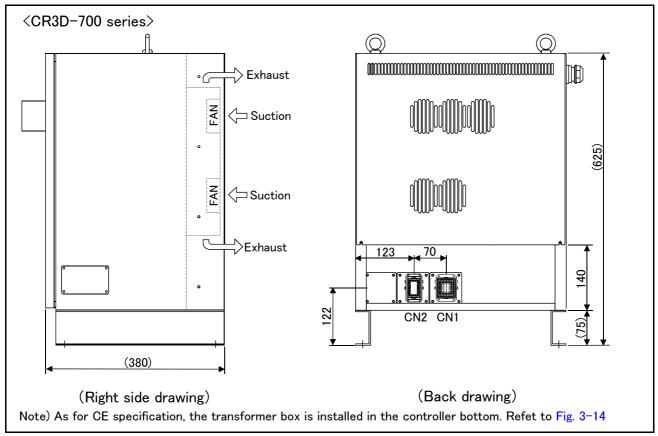


Fig.3-16: Outside dimensions of controller (CR3D-700 Supplement)

3.3.2 Installation dimensions

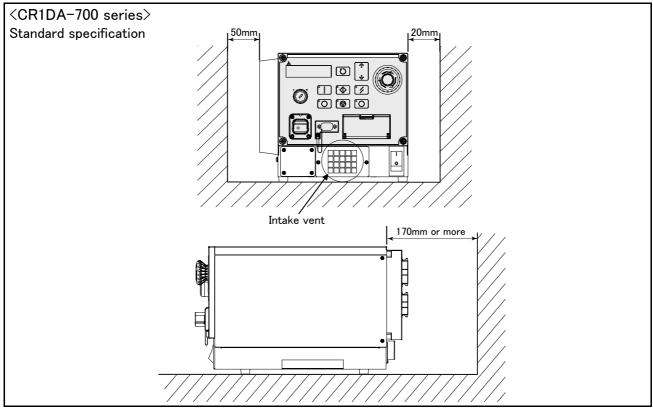


Fig.3-17: Installation of controller (CR1DA-700 series)

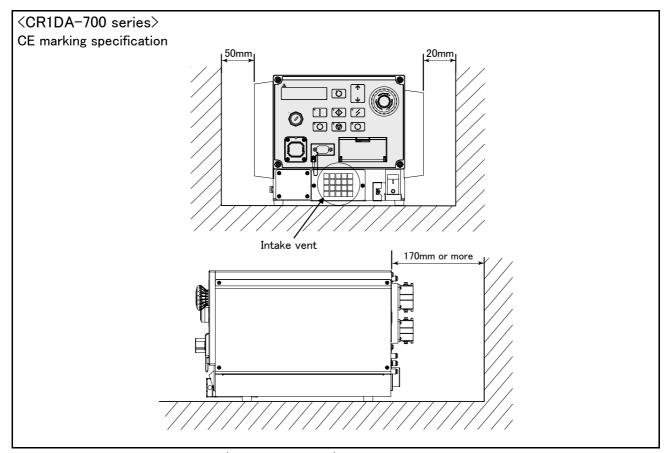
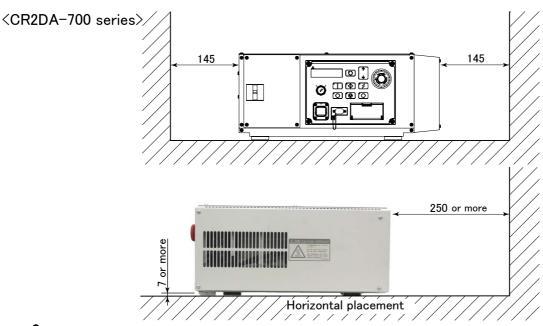
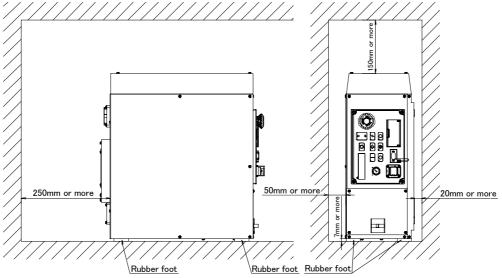


Fig.3-18: Installation of controller (CR1DA-700 series)



!\CAUTION

Use the rubber foot (4 positions) at the bottom of the controller as it is, or put the spacer, and leave the space between the installation side and the controller installation side more than 7mm when you fix the controller with the installation screw. In smaller than 7mm case, the air intake hole at the bottom of the controller is occupied, and temperature rises in the board, and causes the trouble.



ACAUTION

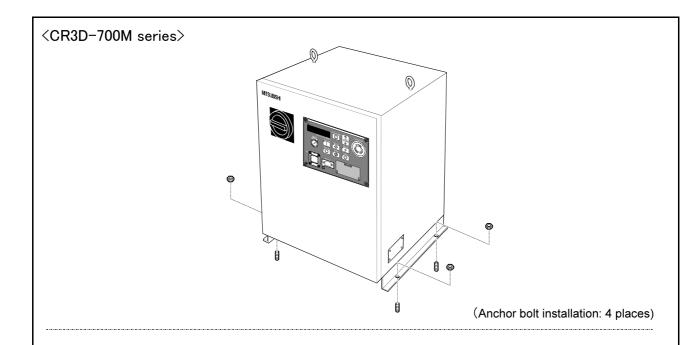
The installation section needs to be fixed so that the controller may not fall. When fixing the controller with the bolt, please use the bolt of the length which does not protrude 5mm or more into the controller case.

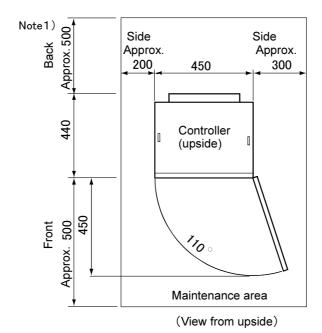
- (1) Remove the rubber foot at the bottom of the controller (four places, $M5 \times 10$ screws).
- (2) Remove the controller side white round seal (four places).
- (3) Use the rubber foot and the 5xM10 screw which were removed by above-mentioned (1), and fix the rubber foot to the screw hole of the seal pasting place of (2).

Fig.3-19: Installation of controller(CR2DA-700 series)



When storing the controller in a cabinet, etc., take special care to the heat radiating properties and ventilation properties so that the ambient temperature remains within the specification values.





Note1) The controller sucks in the outside air and discharges the inside air after cooling (Fig. 3-23). The space required for cooling is 100 mm minimum. Reserve approximately 500 mm of space behind the unit as the maintenance work area.

Note) As for CE specification, the transformer box is installed in the controller bottom. Refet to Fig. 3-14

Fig.3-20: Installation of controller (CR3D-700M series)

3.3.3 Cable lead-in and dimension

The controller has the openings parts for pulling out the cable as shown in Fig. 3-21, Fig. 3-22 and Fig. 3-23.

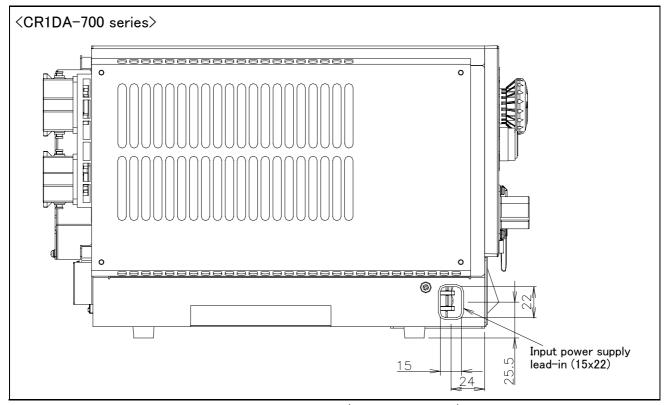


Fig.3-21: Cable lead-in and dimension of the controller (CR1DA-700 series)

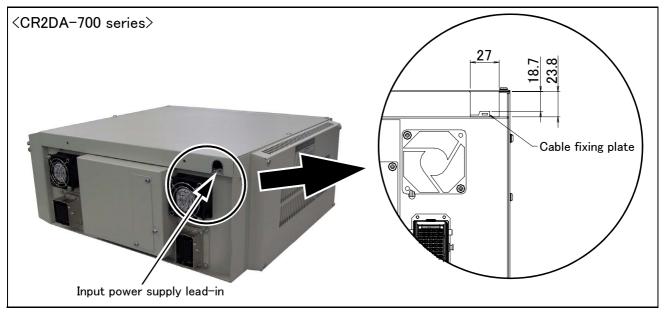


Fig.3-22: Cable lead-in and dimension of the controller (CR2DA-700 series)

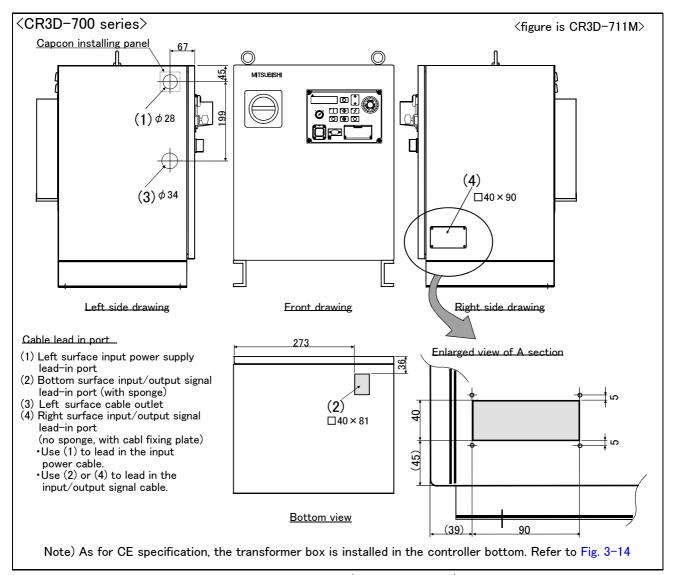


Fig.3-23: Cable lead-in and dimension of the controller (CR3D-700 Series)

3.4 External input/output

3.4.1 Types

(1) Dedicated input/output	These inputs and outputs carry out the robot remote operation and
	status display.
(2) General-purpose input/output	These are inputs and outputs that the customer can program for
	peripheral device control.
(3) Hand input/output	These are inputs and outputs related to the hand that the customer can
	program. (The hand output is an option. The Page 169, "(2) Pneumatic
	hand interface" is required.)
(4)Emergency stop/Door switch input	The wiring for the safe security of the emergency stop etc. is shown in
	on Page 147, "3.6 Emergency stop input and output etc." and on Page
	216, "6.1.7 Examples of safety measures".

<For Reference>

Linking our GOT1000 Series (GT15) display equipment to the robot controller over the Ethernet permits you to control robot controller's input/output from a GOT (graphic operation terminal). Refer to the examples of the use of GOT1000 Series display equipment given in a separate document titled "Detail Description of Functions and Operation."

3.5 Dedicated input/output

Show the main function of dedicated input/output in the Table 3-4. Refer to attached instruction manual "Detailed explanations of functions and operations" in the product for the other functions. Each parameter indicated with the parameter name is used by designated the signal No., assigned in the order of input signal No. and output signal No.

Table 3-4: Dedicated input/output list

Parameter		Input	Note1)		Output
name	Name	Function	Level	Name	Function
TEACHMD		None		Teaching mode out- put signal	Outputs that the teaching mode is entered.
ATTOPMD	None			Automatic mode output signal	Outputs that the automatic mode is entered.
ATEXTMD		None		Remote mode output signal	Outputs that the remote mode is entered.
RCREADY		None		Controller power ON complete signal	Outputs that external input signals can be received.
AUTOENA	Automatic opera- tion enabled input signal	on enabled input		Automatic operation enabled output signal	Outputs the automatic operation enabled state.
START	Start input signal Starts all slots.		E	Operating output signal	Outputs that the slot is operating.
STOP	Stop input signal Stops all slots. The input signal No. is fixed to 0. Note) Use the emergency stop input for stop inputs related to safety.		L	Wait output signal	Outputs that the slot is temporarily stopped.
STOP2	P2 Stop input signal The program during operation is stopped. Unlike the STOP parameter, change of the signal number is possible. Notes) specification is the same as the STOP parameter.		L	Wait output signal	Outputs that the slot is temporarily stopped.
SLOTINIT	Program reset input signal Resets the wait state.		Е	Program selection enabled output signal	Outputs that the slot is in the program selection enabled state.
ERRRESET	Error reset input signal	Resets the error state.	Е	Error occurring output signal	Outputs that an error has occurred.
CYCLE	Cycle stop input signal	Carries out cycle stop.	Е	In cycle stop operation output signal	Outputs that the cycle stop is operating.
SRVOFF	Servo ON enabled input signal	Turns the servo OFF for all mechanisms.	L	Servo ON enabled output signal	Outputs servo-on disable status. (Echo back)
SRVON	Servo ON input signal	Turns the servo ON for all mechanisms.	E	In servo ON output signal	Outputs the servo ON state.
IOENA	Operation rights input signal	Requests the operation rights for the external signal control.	L	Operation rights output signal	Outputs the operation rights valid state for the external signal control.
MELOCK	Machine lock input signal	Sets/resets the machine lock state for all mechanisms.	E	In machine lock output signal	Outputs the machine lock state.
SAFEPOS	Evasion point return input signal	Requests the evasion point return operation.	E	In evasion point return output signal	Outputs that the evasion point return is taking place.
OUTRESET	General-purpose output signal reset	Resets the general-purpose output signal.	E		None
EMGERR		None		Emergency stop out- put signal	Outputs that an emergency stop has occurred.
S1START : S32START	Start input	Starts each slot.	E	In operation output	Outputs the operating state for each slot.
S1STOP : S32STOP	Stop input	Stops each slot.	L	In wait output	Outputs that each slot is temporarily stopped.

Parameter		Input	Note1)		Output	
name	Name	Function	Level	Name	Function	
PRGSEL	Program selection input signal	Designates the setting value for the program No. with numeric value input signals.	E		None	
OVRDSEL	Override selection input signal	Designates the setting value for the override with the numeric value input signals.	E	None		
IODATA Note2)	Numeric value input (start No., end No.)	Used to designate the program name, override value., mechanism value.	L	Numeric value output (start No., end No.)	Used to output the program name, override value., mechanism No.	
PRGOUT	Program No. out- put request	Requests output of the program name.	E	Program No. output signal	Outputs that the program name is being output to the numeric value output signal.	
LINEOUT	Line No. output request	Requests output of the line No.	E	Line No. output signal	Outputs that the line No. is being output to the numeric value output signal.	
OVRDOUT	Override value output request	Requests the override output.	E	Override value out- put signal	Outputs that the override value is being output to the numeric value output signal.	
ERROUT	Error No. output request	Requests the error No. output.	E	Error No. output sig- nal	Outputs that the error No. is being output to the numeric value output signal.	
JOGENA	Jog valid input sig- nal	Validates jog operation with the external signals	E	Jog valid output sig- nal	Outputs that the jog operation with external signals is valid.	
JOGM	Jog mode input 2- bit	Designates the jog mode.	L	Jog mode output 2- Outputs the current jog mode.		
JOG+	Jog feed + side for 8-axes	Requests the + side jog operation.	L	None		
JOG-	Jog feed - side for 8-axes	Requests the - side jog operation.	L	None		
HNDCNTL1 : HNDCNTL3		None		Mechanism 1 hand output signal status : Mechanism 3 hand output signal status	Mechanism 1: Outputs the status of general-purpose outputs 900 to 907. Mechanism 2: Outputs the status of general-purpose outputs 910 to 917. Mechanism 3: Outputs the status of general-purpose outputs 920 to 927.	
HNDSTS1 : HNDSTS3	None			Mechanism 1 hand input signal status : Mechanism 3 hand input signal status	Mechanism 1: Outputs the status of hand inputs 900 to 907. Mechanism 2: Outputs the status of hand inputs 910 to 917. Mechanism 3: Outputs the status of hand inputs 920 to 927.	
HNDERR1 : HNDERR3	Mechanism 1 hand error input signal : Mechanism 3 hand error input signal	Requests the hand error occurrence.	L	Mechanism 1 hand error output signal : Outputs that a hand error is occurring. Mechanism 3 hand error output signal		
AIRERR1 : AIRERR3	Pneumatic pressure error 1 input signal : Pneumatic pressure error 3 input signal	Request the pneumatic pressure error occurrence.	L	Pneumatic pressure error 1 output signal. : Pneumatic pressure error 3 output signal. Outputs that a pneumatic pressure error is occurring.		
M1PTEXC : M3PTEXC		None	L	Maintenance parts replacement time warning signal Outputs that the maintenance parts have reached the replacement time.		
USERAREA Note3)		None		User-designated area 8-points	Outputs that the robot is in the user-designated area.	

Note1) The level indicates the signal level.

L: Level signal → The designated function is validated when the signal is ON, and is invalidated when the signal is OFF.

E: Edge signal → The designated function is validated when the signal changes from the OFF to ON state, and the function maintains the original state even when the signal then turns OFF.

Note2) Four elements are set in the order of input signal start No., end No., output signal start No. and end No.

Note3) Up to eight points can be set successively in order of start output signal No. and end output signal No.

3.6 Emergency stop input and output etc.

Do wiring of the external emergency stop, the special stop input, the door switch, and the enabling device from the "special input/output" terminal connector.

Table 3-5: Special input/output terminal

Item	Name	Function
Input	Emergency stop	Applies the emergency stop. Dual emergency line
Input	Special stop input	Applies the stop. (Refer to Page 151, "3.6.2 Special stop input(SKIP)")
Input	Door switch	Servo-off. Dual line, normal close (Page 153, "3.6.3 Door switch function")
Input	Enabling device	Servo-off. Dual line, normal close (Page 153, "3.6.4 Enabling device function")
Output	Robot error output	Contactor is opening during error occurrence
Output	Mode output	MANUAL mode: contactor is opening, AUTO mode: contactor is closing.
Output	Magnet contactor control connector output for addition axes	When an additional axis is used, the servo ON/OFF status of the additional axis can be synchronized with the robot arm. (Page 161, "3.8 Magnet contactor control connector output (AXMC) for addition axes")

^{*}At the time of the power supply OFF, the output point of contact is always open.

[Note] The contact capacity of each input/output terminal is DC24V/10mA - 500mA. Don't connect the equipment except for this range. The use exceeding contact capacity causes failure.

Pin number assignment of each terminal and the circuit diagram are shown in Fig. 3-27.

3.6.1 Connection of the external emergency stop

The external emergency stop input and door switch input and enabling device input are opened at shipment as shown in Fig. 3-27.

Connect the external emergency stop switch and door switch with the following procedure.

[Caution] Since the emergency stop, the enabling device, and the door switch circuits are made dual circuits inside the controller, all the emergency stop switches should use dual contact type. Remove the contact capacity sticker stuck on the connector (EMGIN, EMGOUT, SKIP) and connect the emergency switch.

- 1) Prepare the "emergency stop switch", "enabling device" and "door switch".
- 2) Securely connect the external emergency stop's contacts across 3A-4A, 3B-4B, and the door switch's contacts across 8A-9A, 8B-9B, and the enabling device switch's contacts across 10A-11A, 10B-11B, on the terminal block.

[Caution] When wiring the emergency stop switch (double emergency line type) and SKIP input signal, wire both contacts to the two terminal blocks on the controller. If both contacts are wired to only one of the terminal blocks, errors cannot be cancelled using the door switch. The cable uses the shielded cable and installs the ferrite core. Install the ferrite core in less than 30cm from the contact button.



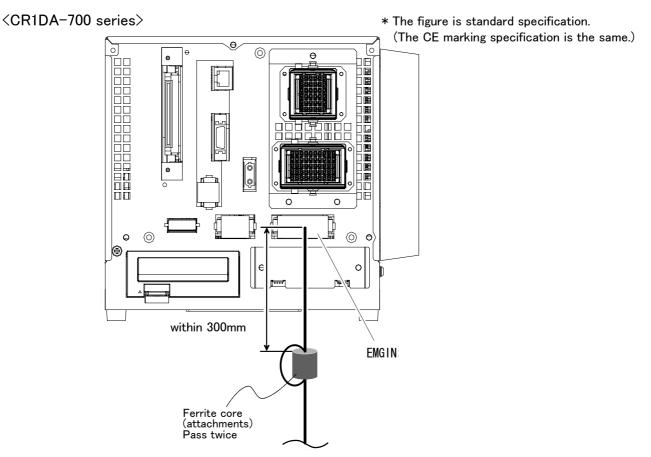
You should always connect doubly connection of the emergency stop, the door switch, and the enabling switch. (Connect with both of side-A and side-B of the controller rear connector) In connection of only one side, if the relay of customer use should break down, it may not function correctly.



Please be sure to check that each function operates normally for the prevention of malfunction. Surely check that the operation of the emergency stop of the robot controller, the emergency stop of the teaching pendant, the customer's emergency stop, etc are normally.



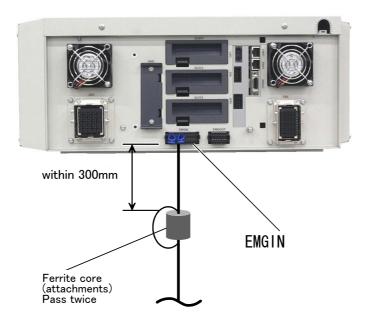
Be sufficiently careful and wiring so that two or more emergency stop switches work independently. Don't function only on AND conditions (Two or more emergency stop switch status are all ON).



Pin allotment of EMGIN and the EMGOUT connector is shown in Fig. 3-27.

Fig.3-24: emergency stop cable connection (DR1DA-700)

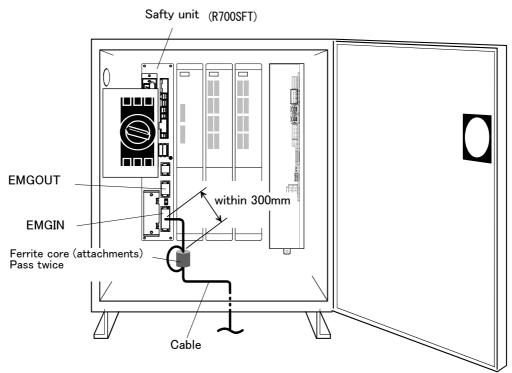
<CR2DA-700>



Pin allotment of EMGIN and the EMGOUT connector is shown in Fig. 3-27.

Fig.3-25: emergency stop cable connection(CR2DA-700)

<CR3D-700/700M>



Pin allotment of EMGIN and the EMGOUT connector is shown in Fig. 3-27.

Fig.3-26 : Emergency stop cable connection(CR3D-700)

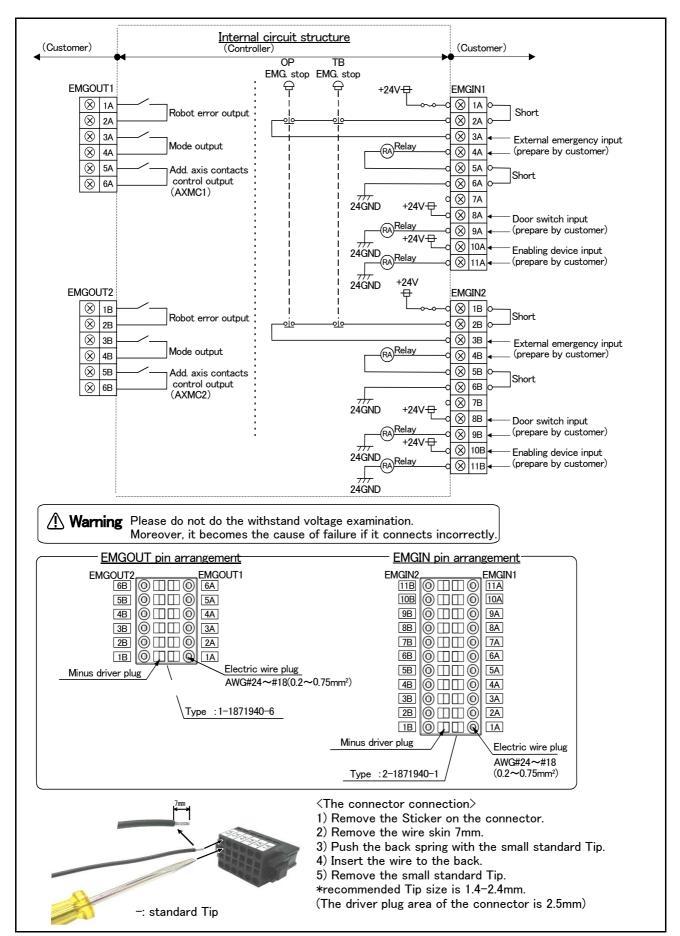


Fig.3-27: External emergency stop connection



CAUTION Please be sure to install the emergency stop switch and it is connection to the controller, to stop the robot immediately at emergency



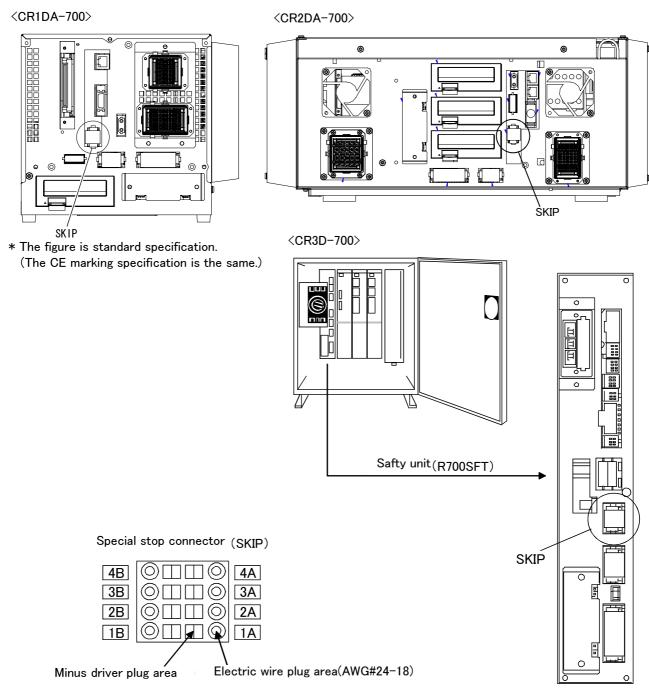
Be careful of the short circuit at cable connection. And, don't give plating solder to the electric wire. Loose connection may occur.

3.6.2 Special stop input(SKIP)

The skip is the input signal to stop the robot. Wire 1A-1B of the special stop connector (SKIP) shown in Page 152, "Fig.3-28: Connection of the special-stop-input".

Table 3-6: Special stop input electric specification

	Item Specifications		Internal circuit		
Туре		DC input			
No. of input p	oint	1			
Insulation met	hod	Phto-coupler insulation			
Rated inpit vo	ltage	DC24V	ļ		
Rated input c	urrent	approx. 11mA	1A +24V(COM)		
Working volta	ge range	DC 21.6 ~ 26.4V (Ripple rate within 5 %)	330		
ON voltage/C	N current	DC 8V or more / 2mA or more	1B 2.2k Input		
OFF voltage/	OFF current	DC 4V or less / 1mA or less			
Input resistan	ce	approx. 2.2 k Ω			
Response	OFF → ON	1ms or less			
oN → OFF		1ms or less			
Common method		1 point per common			
External wire	connection method	Connector			



<The connector connection method>

The electric wire skins covering 7mm.

In the condition that the minus driver is inserted, insert the electric wire, and remove the minus driver.

The electric wire is locked by the connector.

Fig.3-28: Connection of the special-stop-input

3.6.3 Door switch function

This function retrieves the status of the switch installed on the door of the safety fence, etc., and stops the robot when the door is opened. This differs from an emergency stop in that the servo turns OFF when the door is opened and an error does not occur. Follow the wiring example shown in Fig. 3–27, and wire so that the contact closes when the door is closed. Details of this function according to the robot status are shown below.

*During automatic operationWhen the door is opened, the servo turns OFF and the robot stops. An error occurs.

The process of the restoration : Close the door, reset the alarm, turn on the servo, and restart

*During teaching......Even when the door is opened, the servo can be turned ON and the robot moved using the teaching pendant.

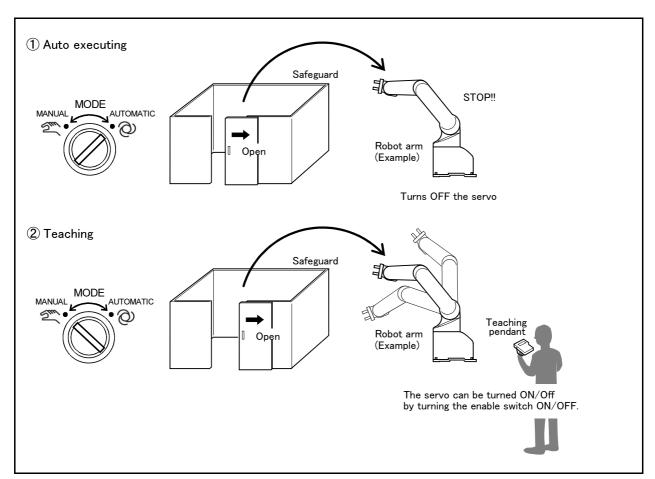


Fig.3-29: Door switch function

3.6.4 Enabling device function

When the abnormalities occur in teaching operations etc., the robot's servo power can be immediately cut only by switch operation of the enabling device*1) (servo-off), and the safety increases. To use the robot safely, please be sure to connect the enabling device.

(1) When door is opening

Please do teaching by two-person operations. One person has T/B, the other has enabling device. Turn on the servo power, in the condition that both of switches are pushed. (Enable switch of T/B and enabling device) Then the jog operation will be available. You can off the servo power only by releasing the switch of the enabling device. And, care that the servo-on and releasing the brake cannot be done in the condition that the switch of the enabling device is released.

(2) When door is closing

You can turn on the servo power by operation of only T/B. In this case perform jog operation outside the safeguard sure.

*1) Recommendation products: HE1G-L20MB (IDEC)

(3) Automatic Operation/Jog Operation/Brake Release and Necessary Switch Settings The following is a description of various operations performed on the robot and switch settings that are required.

Table 3-7: Various operations and necessary switch settings

			Relate				
No	Operation	Mode of controller	T/B enable/ disable	T/B enable switch	Enabling device input terminal	Door switch input terminal	Description
1	Jog operation	Manual	Enable	ON	Close(ON)	_	If the enabling device input is set to Close (On), the state of door switch input does not matter.
2	Jog operation Note2)	Manual	Enable	ON	Open(OFF)	Close (Door Close)	If the enabling device input is set to Open (Off), door switch input must be in a state of Close
3	Brake release Note3)	Manual	Enable	ON	Close(ON)	_	Irrespective of the state of door switch input, enabling device input must be in a state of Close (On).
4	Automatic operation	Automatic	Disable	_	_	Close (Door Close)	Door switch input must always be in a state of Close (Door Close).

- Note1) "-" in the table indicates that the state of switch concerned does not matter.
- Note2) Jog operation, if door switch input is set for Close (Door Close), must be performed outside the safety bar-
- Note3) It is imperative that brake release operation be carried out by two persons. One person turns on the enabling device ("Close" on the enabling device input terminal) while the other manipulates the T/B. Brake release can be effected only when both of the enabling switch device and the T/B enable switch are placed in intermediate position (lightly gripped position). At this point, the state of door switch input does not matter.

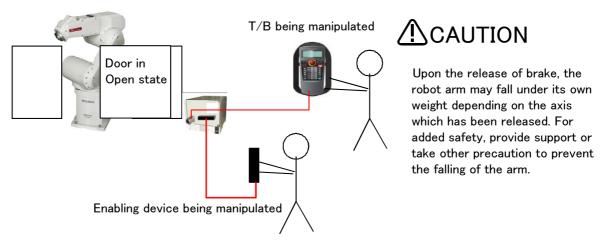


Fig.3-30: Brake release operation

3.7 Additional Axis Function

This controller is equipped with an additional axis interface for controlling an additional axis when a traveling axis or rotary table is added to the robot. A maximum of eight axes of servo motors can be controlled at the same time by connecting a general-purpose servo amplifier (MR-J3-B series) that supports Mitsubishi's SSC Net III. Refer to the separate "Additional axis interface Instruction Manual" for details on the additional axis function.

3.7.1 Wiring of the Additional Axis Interface

Table 3-8 shows the connectors for additional axes inside the controller and Fig. 3-31, Fig. 3-32, Fig. 3-33 shows a connection example (configuration example). The magnet contactor control connector for additional axes, AXMC1, is designed to accommodate circuit connection with improved safety in Mitsubishi's industrial robot systems connecting additional axes.

Please be sure to install the noise filter in the power supply line of addition axis servo amplifier and to use the robot safely. The example of the installation of the noise filter is shown in Page 159, "(1) Example of the installation of the noise filter". Install by one of the methods.

Please implement the appropriate circuit connection by refer to Page 161, "3.8 Magnet contactor control connector output (AXMC) for addition axes".

Table 3-8: Dedicated Connectors inside the Controller

Name	Connector name	Details
Connector for additional axes	CR1DA/CR2DA: OPT CR3D: OPT2	The connector for connecting the general-purpose servo amplifier.
Magnet contactor control connector for additional axes	EMGOUT	This contact output is used to turn ON/OFF the motor power by connecting to general-purpose servo amplifiers.

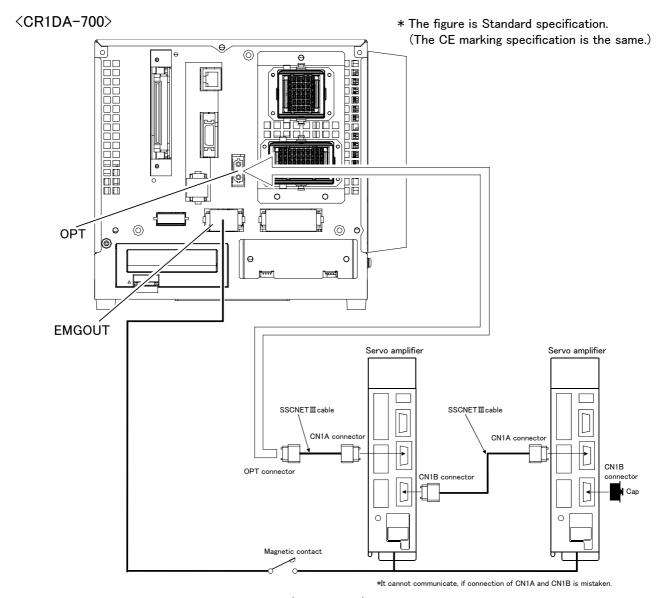
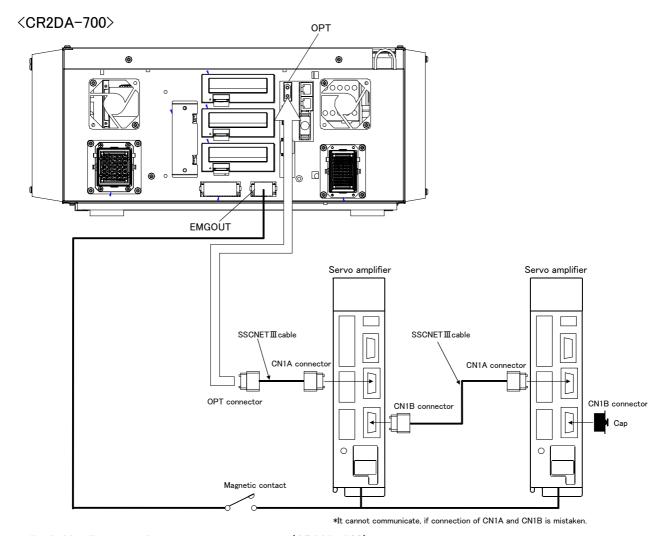
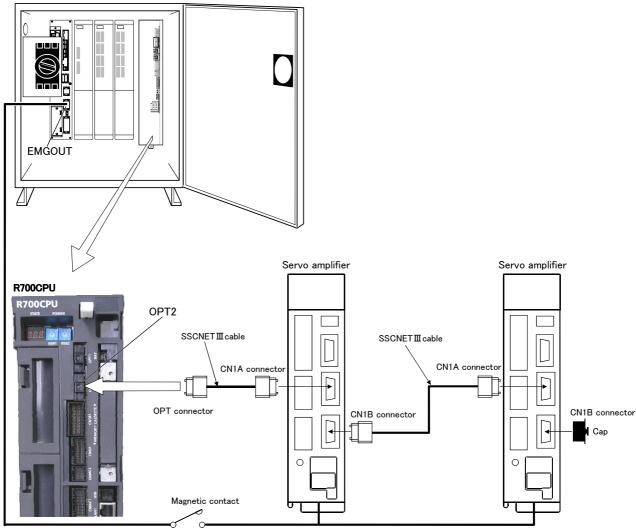


Fig.3-31: Example of addition axis connection (CR1DA-700)



 $Fig. 3-32: Example \ of \ addition \ axis \ connection \ (CR2AD-700)$

<CR3-700/700M>



*It cannot communicate, if connection of CN1A and CN1B is mistaken.

Fig.3-33: Example of addition axis connection (CR3D-700/700M)

- (1) Example of the installation of the noise filter
- 1) EMC filter (recommended)

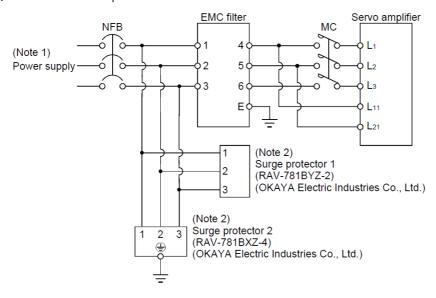
Please install the recommendation filter shown below according to the example of connection.

1) Combination with the servo amplifier

Servo amplifier	Recommended filt	er (Soshin Electric)	Mass [kg]([lb])	
Servo ampilier	Model	Leakage current [mA]		
MR-J3-10B to MR-J3-100B MR-J3-10B1 to MR-J3-40B1	(Note) HF3010A-UN	5	3 (6.61)	
MR-J3-250B • MR-J3-350B	(Note) HF3030A-UN		5.5 (12.13)	
MR-J3-500B • MR-J3-700B	(Note) HF3040A-UN	1.5	6.0 (13.23)	
MR-J3-11KB to MR-J3-22KB	(Note) HF3100A-UN	6.5	15 (33.07)	
MR-J3-60B4 • MR-J3-100B4	TF3005C-TX		6(12.22)	
MR-J3-200B4 to MR-J3-700B4	TF3020C-TX		6(13.23)	
MR-J3-11KB4	TF3030C-TX	5.5	7.5(16.54)	
MR-J3-15KB4	TF3040C-TX		10.5(07.56)	
MR-J3-22KB4	TF3060C-TX		12.5(27.56)	

Note. A surge protector is separately required to use any of these EMC filters.

2) Connection example



- Note 1. For 1-phase 200V to 230VAC power supply, connect the power supply to L_1,L_2 and leave L_3 open. There is no L_3 for 1-phase 100 to 120VAC power supply. Refer to section 1.3 for the power supply specification.
 - 2. The example is when a surge protector is connected.

Fig.3-34: Example of EMC noise filter installation

2) Line noise filter

This filter is effective in suppressing noises radiated from the power supply side and output side of the servo amplifier and also in suppressing high-frequency leakage current (zero-phase current) especially within 0.5MHz to 5MHz band.

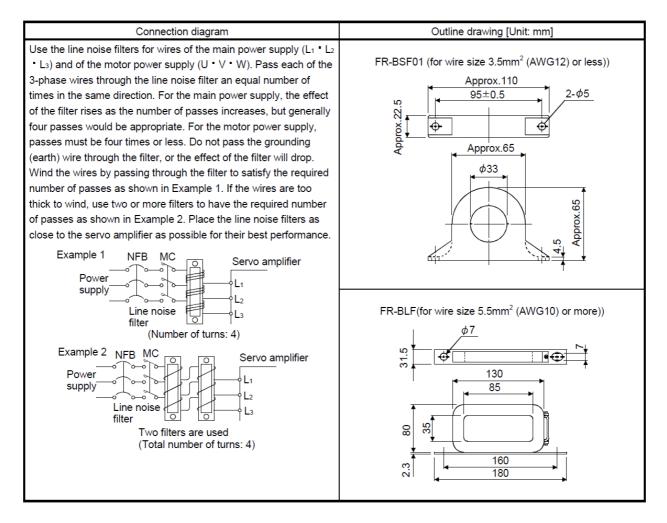


Fig.3-35: Example of noise filter installation

3.8 Magnet contactor control connector output (AXMC) for addition axes

When an additional axis is used, the servo ON/OFF status of the additional axis can be synchronized with the servo ON/OFF status of the robot itself by using the output contact (AXMC) provided on the rear or inside of the controller and configuring a circuit so that the power to the servo amplifier for the additional axis can be turned off when this output is open.

Fig. 3-36 shows an example of its circuit, and Fig. 3-37, Fig. 3-38, Fig. 3-39 show the layout drawings of the output contact (EMGOUT). When you are using an additional axis, please perform appropriate circuit connections by referring to these drawings.

Refer to the separate "Additional axis interface Instruction Manual" for details on the additional axis function.

Note1) you use the addition axis function as a user mechanism who became independent of the robot arm, please do not connect this output signal. Servo-on of the user mechanism may be unable.

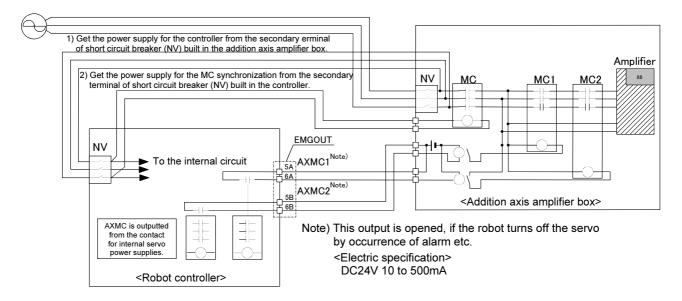


Fig.3-36: Example of circuit for addition axes of Magnet contactor control output

<CR1DA-700>

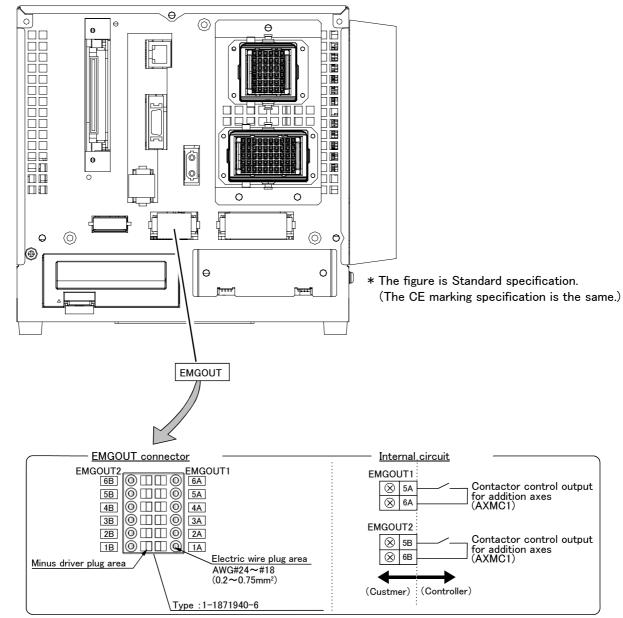


Fig.3-37: EMGOUT connector (CR1DA-700)

<CR2DA-700>

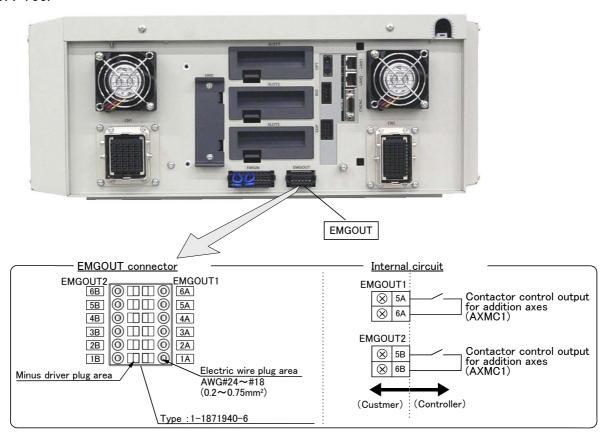


Fig.3-38: EMGOUT connector (CR2DA-700)

<CR3D-700/700M> Safty unit (R700SFT) **EMGOUT** EMGOUT connector Internal circuit EMGOUT2 EMGOUT1 6B 0 0 6A 5B 0 0 4A 3B 0 0 3A 2B 0 0 2A IB 0 1 0 1A Flect EMGOUT1 Contactor control output for addition axes (AXMC1) ⊗ 5A ⊗ 6A EMGOUT2 Contactor control output for addition axes (AXMC1) ⊗ 5B Electric wire plug area AWG#24~#18 (0.2~0.75mm²) ⊗ 6B Minus driver plug area (Custmer) (Controller)

Fig.3-39: EMGOUT connector (CR3D-700/700M)

Type :1-1871940-6

3.9 Options

■ What are options?

There are a variety of options for the robot designed to make the setting up process easier for user needs. User installation is required for the options.

Options come in two types: "set options" and "single options".

1.	Set options	A combination o	of single	options	and parts	that	together,	form a	set for	serving
		some purpose.								

2. Single options......That are configured from the fewest number of required units of a part. Please choose user's purpose additionally.

(1) Teaching pendant (T/B)

■ Order type: R32TB :Cable length 7m

R32TB-15 :Cable length 15m

Outline



This is used to create, edit and control the program, teach the operation position and for jog feed, etc.

For safety proposes, a 3-position enable switch is mounted.*1)

■ Configuration

Table 3-9: Configuration device

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
Teaching pendant	R32TB	Either one pc.	1.7	Cable length is 7m. Hand strap is attached.
	R32TB-15	Eluler one pc.	2.8	Cable length is 15m. Hand strap is attached.

Note1) Mass indicates one set.

Specifications

Table 3-10: Specifications

Items	Specifications	Remarks
Outline dimensions	195(W) x 292(H) x 106(D) (refer to outline drawing)	
Body color	Dark gray	
Mass	Approx. 0.9kg (only arm, excluding cable)	
Connection method	Connection with controller and square connector (24-pin)	
Interface	RS-422	
Display method	LCD method: 24 characters x 8 lines, LCD illumination: with backlight	At 8x8 font
Operation section	36 keys	

In ISO/10218 (1992) and JIS-B8433 (1993), this is defined as an "enable device". These standards specify that the robot operation using the teaching pendant is enabled only when the "enable device" is at a specified position. With the Mitsubishi Electric industrial robot, the above "enable device" is configured of an "Enable/Disable switch" and "Deadman switch".

The 3-position deadman switch has three statuses. The following modes are entered according to the switch state.

- a) "Not pressed"The robot does not operate. *)
- b) "Pressed lightly"The robot can be operated and teaching is possible.
- c) "Pressed with force"The robot does not operate. $^{*)}$

^{*1) &}lt;3-position enable switch>

^{*)} Operations, such as program editing and status display, other than robot operation are possible.

Safety is secured as the servo power is turned OFF simultaneously with the input of the emergency stop.

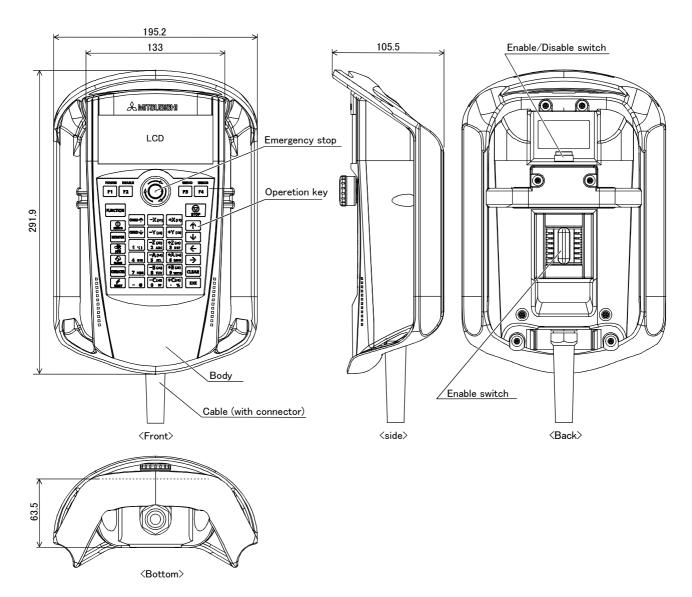


Fig.3-40: Outside dimensions of teaching pendant

■ Installation method

The teaching pendant is connected to the T/B connector on the front of the controller.

Note) The connector may be felt hard if installation and removal of the teaching pendant or the dummy plug is repeated to the frequent.

■ Key layout and main functions

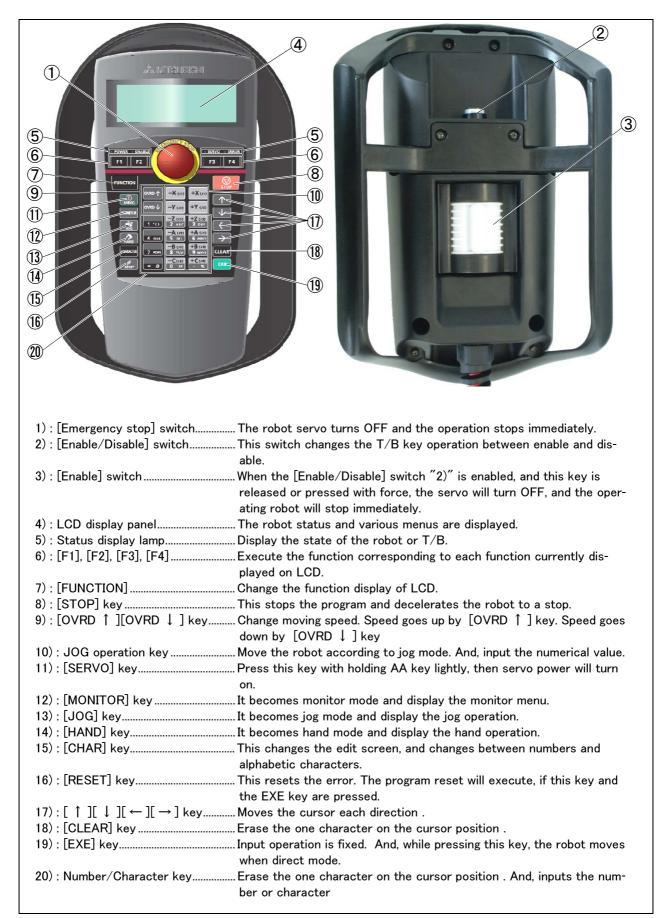


Fig.3-41: Teaching pendant key layout and main functions

(2) Pneumatic hand interface

■ Order type: 2A-RZ365(Sink type)/2A-RZ375(Source type)

■ Outline



This interface is required to use the robot arm's hand output signals.

- Up to eight hand output points can be used with this interface.
- The eight hand input points can be used without this interface.
- The previous pneumatic hand interface can be used.

■ Configuration

Table 3-11: Configuration device

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
Pneumatic hand interface	2A-RZ365(Sink type)	Either	0.1	Output 8 points expansion.
	2A-RZ375(Source type)	one pc.	0.1	

Note1) Mass indicates one set.

■ Specifications

Table 3-12: Specifications

Item		Specification	Internal circuit		
Туре		Transistor output	<sink type=""></sink>		
No. of output points		8	24V		
Insulation method		Photo coupler insulation	(Internal power supply)		
Rated load voltage		DC24V	中		
Rated load voltage ran	ge	DC21.6 to 26.4VDC			
Max. current load		0.1A/ 1 point (100%)	GRņ*		
Current leak with powe	er OFF	0.1mA or less	l l l l l l l l l l l l l l l l l l l		
Maximum voltage drop	with power ON	DC0.9V(TYP.) Note1)	7~~		
Response time	OFF-ON	2ms or less (hardware response time)			
	ON-OFF	2 ms or less (resistance load) (hardware response time)	Fuse \(\)		
Fuse rating		Fuses 1.0A (each one common)	1.0A		
Common method		8 points, 1 common	<u> </u>		
			ov		
			<source type=""/>		
			Fuse +24V 1.0A		
			GRn*		
			↓ ✓ ✓ ✓		
			24GND(COM)		
			* GRn = GR1 ∼ GR8		

Note1) The drop voltage maximum value at turning on the signal.

The available solenoid valve is that the specification of rated voltage is DC24V $\pm\,10\%$

■ Installation method

This is mounted in the controller.

Attach the pneumatic hand interface (2A-RZ365/2A-RZ375) to the CNHNDOUT/CNHND connector of the hand interface relay card (2D-TZ315) securely. Refer to separate "Instruction Manual/ Controller setup, basic operation, and maintenance" for details on the installing method.

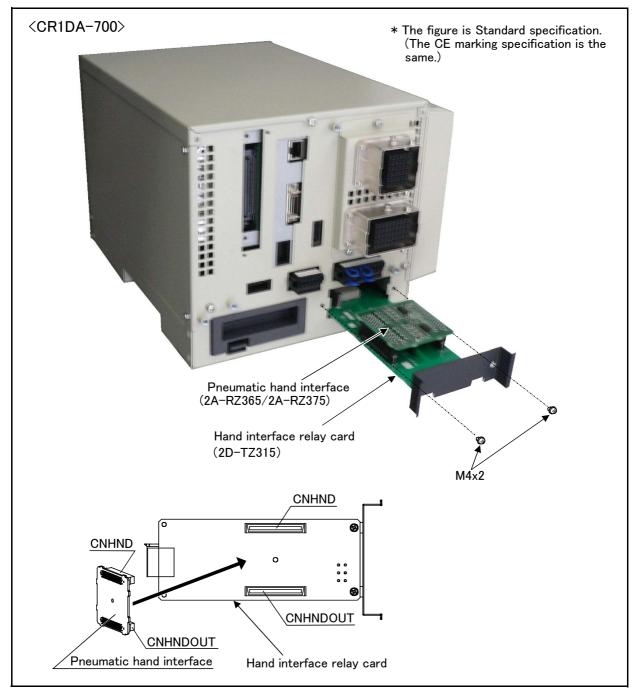


Fig.3-42: Installation of the pneumatic hand interface (CR1DA-700)

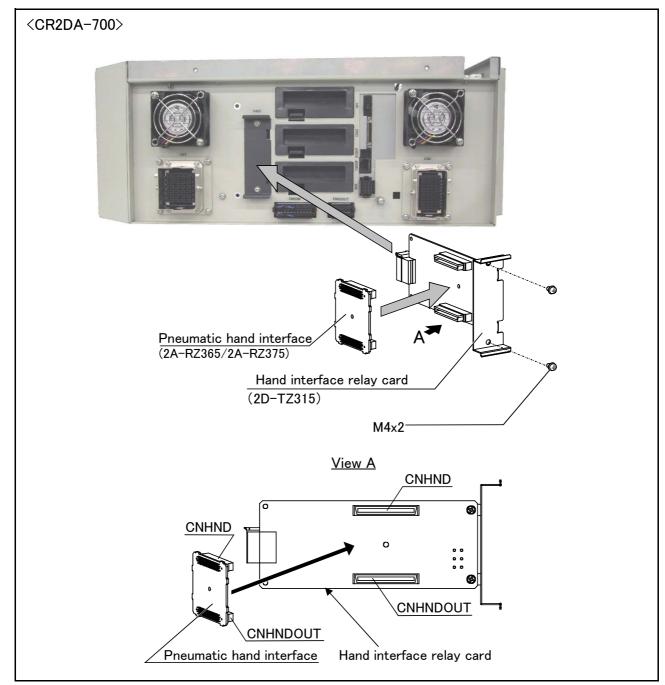


Fig.3-43: Installation of the pneumatic hand interface (CR2DA-700)

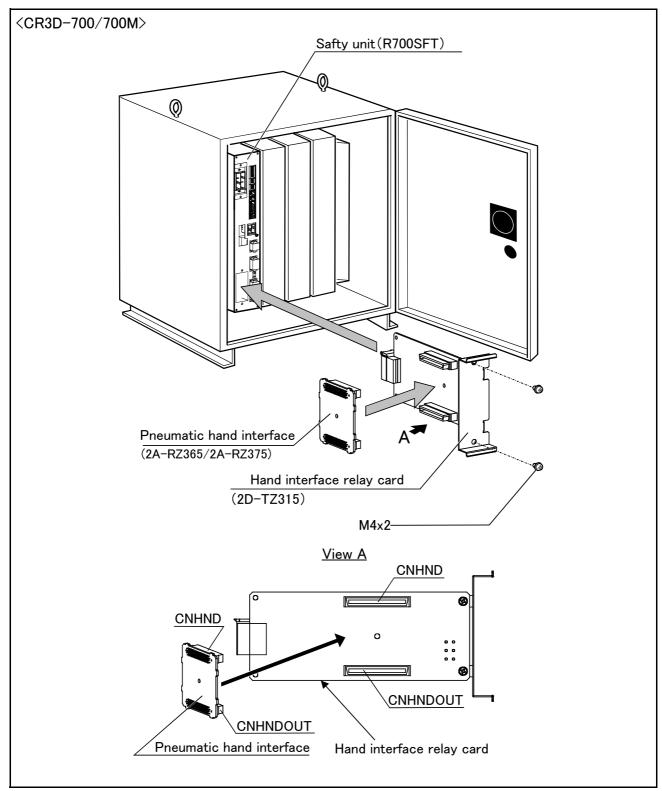


Fig.3-44 : Installation of the pneumatic hand interface (CR3D-700/700M)

(3) Parallel I/O interface

■ Order type : ● 2D-TZ368 (Sink type) /2D-TZ378 (Source type) *One 2D-TZ378(Source type) is installed for CE Marking specification at shipping. (Only S312 and S12 specification)

Outline



This is used to expand the external inputs and outputs

• The connecting cable with external equipment is not attached. Since we are preparing the external input-and-output cable (2D-CBL05 or 2D-CBL15) as the option, please use. Notes)Although the combined use with the parallel input-and-output unit (2A-RZ361/2A-RZ371) of another option is also possible, please use the setup of the station number by the different number separately. The station number is automatically determined by the position of the option slot which installed this interface. (station number 0 to 2)

■ Configuration

Table 3-13: Configuration device

Part name	Type	Qty.	Mass(kg) Note1)	Remarks
Parallel I/O interface	2D-TZ368	Either	0.4	Input/output 32 points/32 points
	2D-TZ378	one pc.	0.4	2D-TZ368 is sink type. 2D-TZ378 is source type.

Note1) Mass indicates one set.

■ Specifications

- 1) The CR1DA-700 series controller can connect this one interface.
- 2) The CR2DA-700 and CR3D-700 series controller can connect this three interfaces.
- 3) The CR3D-700 series controller can connect this three interfaces.

Table 3-14: Electrical specifications of input circuits

Item		Specification	Internal circuit	
Туре	ype DC input Sink type>			
Number of input po	oints	32	.+24V/+12V	
Insulation method		Photo coupler insulation	(COM)	
Rated input voltage	9	DC12V/DC24V	7	
Rated input curren	t	Approx. 3mA/7mA	│	
Working voltage range		DC10.2 ~ 26.4V (Ripple factor should be less than 5%)	2.7K	
ON voltage/ON cu	rrent	DC8V or more/2mA or more		
OFF voltage/ OFF	current	DC4V or less/1mA or less	Source type>	
Input resistance		Approx. 2.7k Ω	2.7K Input	
Response time	OFF-ON	10ms or less(DC24V)	7607 1020	
ON-OFF		10ms or less(DC24V)		
Common method		8points per common	0 V(COM)	
External cable connection method		Connector		

	Item	Specification	Internal circuit
Туре		Transistor output	⟨Sink type⟩
No. of o	utput points	32	.04//.40/
Insulation	on method	Photo-coupler insulation	+24V/+12V
Rated lo	oad voltage	DC12V/DC24V	Output
Rated lo	oad voltage	DC10.2 ~ 30V(peak voltage DC30V)	
Max. loa	nd current	0.1A/point (100%)]
Leakage OFF	e current at	0.1mA or less	Fuse
Max. vo ON	Itage drop at	DC0.9V(TYP.) Note1)	⟨Source type⟩ Fuse
Respo	OFF-ON	10ms or less(Resistance load) (hardware response time)	+ <u>Z4V/+1ZV</u>
nse time	ON-OFF	10ms or less(Resistance load) (hardware response time)	Output
Fuse rating		Fuse 1.6A(one per common) Replacement possible (max. 3)	
Common method		16 points per common (common terminal: 2points)	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
Externa tion met	l wire connec- thod	Connector	'
Exter-	Voltage	DC12/24V(DC10.2 ~ 30V)	1
nal power supply	Current	60mA(TYP.DC24V per common)(base drive current)	

Table 3-15: Electrical specifications for the output circuits

Note1) The maximum voltage drop value at signal ON Refer to it for the equipment connected to the output circuit.



/ Caution The protection fuse of the output circuit prevents the failure at the time of the load short circuit and incorrect connection. The load connected of the customer should be careful not to exceed maximum rating current. The internal transistor may be damaged if maximum rating current is exceeded.

■ Installation method

The expansion parallel input/output interface is installed in the controller. Refer to separate "Instruction Manual/ Controller setup, basic operation, and maintenance" for details on the installing method.

If it installs in the option SLOT of the controller, the station number will be assigned automatically.

SLOT1: station number 0(0 to 31) SLOT2: station number 1(32 to 63) SLOT3: station number 2(64 to 95)

Notes) The CR1DA-700 series controller can connect SLOT1 only.

All of SLOT1/SLOT2/SLOT3 can use CR2DA-700 and the CR3D-700 series controller.



igwedge Caution If it uses together with parallel input-and-output unit 2A-RZ361/2A-RZ371, please do not overlap with the station number of the parallel input-and-output interface.

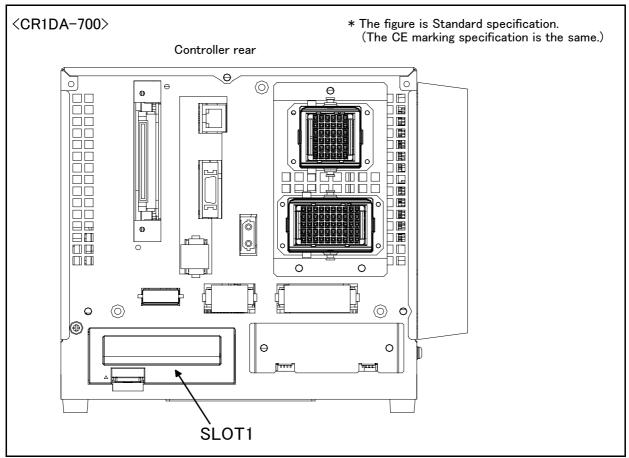


Fig.3-45 : Parallel I/O interface installation position (CR1DA-700)

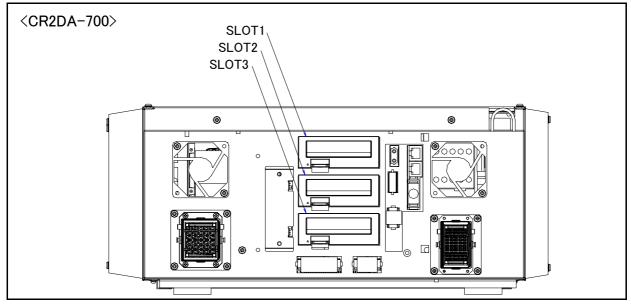


Fig.3-46: Parallel I/O interface installation position (CR2DA-700)

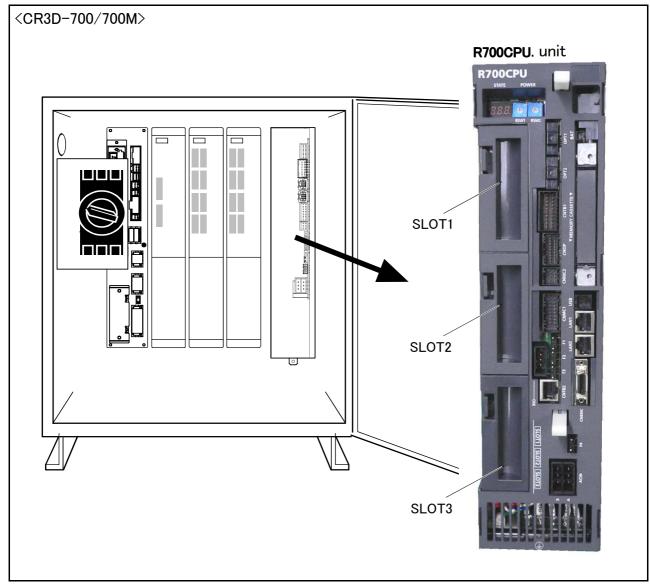


Fig.3-47 : Parallel I/O interface installation position (CR3D-700/700M)

■ Pin layout of connector

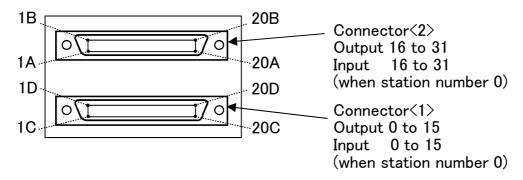


Fig.3-48: Pin layout of connector

lacktriangle Connector pin No. and signal assignment

The station number is fixed by the slot to install and the allocation range of the general-purpose input-and-output signal is fixed.

Table 3-16: The slot number and the station number

Slot	Station	Range of the general-purpo	se input-and-output signal
number ^{Note1)}	number	Connector <1>	Connector <2>
SLOT1	0	Input: 0 to 15 Output: 0 to 15	Input : 16 to 31 Output : 16 to 31
SLOT2	1	Input : 32 to 47 Output : 32 to 47	Input : 48 to 63 Output : 48 to 63
SLOT3	2	Input : 64 to 79 Output : 64 to 79	Input: 80 to 95 Output: 80 to 95

Note1) In case of the CR1DA controller, the available slot is only SLOT1.

The connector pin number of the parallel input-and-output interface installed in SLOT1 and signal number allocation are shown in Table 3-17 and Table 3-18. If it installs in other slots, please interpret and utilize.

Table 3-17 : Connector<1> pin assignment list and external I/O cable (2D-CBL**) color(SLOT1)

		Functio	Function name		,	Functio	Function name	
Pin No.	Line color	General-purpose	Dedicated/power supply, common	Pin No.	Line color	General-purpose	Dedicated/power supply, common	
1C	Orange/Red a		0V : For pins 5D-20D	1D	Orange/Black a		12V/24V : For pins 5D-20D	
2C	Gray/Red a		COM: For pins 5C-20C ^{Note1)}	2D	Gray/Black a		Reserved	
3C	White/Red a		Reserved	3D	White/Black a		Reserved	
4C	Yellow/Red a		Reserved	4D	Yellow/Black a		Reserved	
5C	Pink/Red a	General-purpose input 15		5D	Pink/Black a	General-purpose output 15		
6C	Orange/Red b	General-purpose input 14		6D	Orange/Black b	General-purpose output 14		
7C	Gray/Red b	General-purpose input 13		7D	Gray/Black b	General-purpose output 13		
8C	White/Red b	General-purpose input 12		8D	White/Black b	General-purpose output 12		
9C	Yellow/Red b	General-purpose input 11		9D	Yellow/Black b	General-purpose output 11		
10C	Pink/Red b	General-purpose input 10		10D	Pink/Black b	General-purpose output 10		
11C	Orange/Red c	General-purpose input 9		11D	Orange/Black c	General-purpose output 9		
12C	Gray/Red c	General-purpose input 8		12D	Gray/Black c	General-purpose output 8		
13C	White/Red c	General-purpose input 7		13D	White/Black c	General-purpose output 7		
14C	Yellow/Red c	General-purpose input 6		14D	Yellow/Black c	General-purpose output 6		
15C	Pink/Red c	General-purpose input 5	Operation rights input signal ^{Note2)}	15D	Pink/Black c	General-purpose output 5		
16C	Orange/Red d	General-purpose input 4	Servo ON input signal Note2)	16D	Orange/Black d	General-purpose output 4		
17C	Gray/Red d	General-purpose input 3	Start input ^{Note2)}	17D	Gray/Black d	General-purpose output 3	Operation rights output signal Note2)	
18C	White/Red d	General-purpose input 2	Error reset input signal Note2)	18D	White/Black d	General-purpose output 2	Error occurring output signal Note2)	
19C	Yellow/Red d	General-purpose input 1	Servo OFF input signal Note2)	19D	Yellow/Black d	General-purpose output 1	In servo ON output signal ^{Note2)}	
20C	Pink/Red d	General-purpose input 0	Stop input Note3)	20D	Pink/Black d	General-purpose output 0	Operating output Note2)	

Note1) Sink type:12V/24V(COM), Source type:0V(COM)

Note2) The dedicated signal is assigned at shipping. It can change with the parameter.

Note3) The dedicated input signal (STOP) is assigned at shipping. The signal number is fixing.

Table 3-18: Connector<2> pin assignment list and external I/O cable (2D-CBL**) color(SLOT1)

Pin		Function name		Pin		Functio	n name
No.	Line color	General-purpose	Dedicated/power supply, common	No.	Line color	General-purpose	Dedicated/power supply, common
1A	Orange/Red a		0V : For pins 5B-20B	1B	Orange/Black a		12V/24V : For pins 5B-
							20B
2A	Gray/Red a		COM: For pins 5A-	2B	Gray/Black a		Reserved
			20A ^{Note1)}				
3A	White/Red a		Reserved	3B	White/Black a		Reserved
4A	Yellow/Red a		Reserved	4B	Yellow/Black a		Reserved
5A	Pink/Red a	General-purpose input 31		5B	Pink/Black a	General-purpose output 31	
6A	Orange/Red b	General-purpose input 30		6B	Orange/Black b	General-purpose output 30	
7A	Gray/Red b	General-purpose input 29		7B	Gray/Black b	General-purpose output 29	
8A	White/Red b	General-purpose input 28		8B	White/Black b	General-purpose output 28	
9A	Yellow/Red b	General-purpose input 27		9B	Yellow/Black b	General-purpose output 27	
10A	Pink/Red b	General-purpose input 26		10B	Pink/Black b	General-purpose output 26	
11A	Orange/Red C	General-purpose input 25		11B	Orange/Black c	General-purpose output 25	
12A	Gray/Red c	General-purpose input 24		12B	Gray/Black c	General-purpose output 24	
13A	White/Red c	General-purpose input 23		13B	White/Black c	General-purpose output 23	
14A	Yellow/Red c	General-purpose input 22		14B	Yellow/Black c	General-purpose output 22	
15A	Pink/Red c	General-purpose input 21		15B	Pink/Black c	General-purpose output 21	
16A	Orange/Red d	General-purpose input 20		16B	Orange/Black d	General-purpose output 20	
17A	Gray/Red d	General-purpose input 29		17B	Gray/Black d	General-purpose output 19	
18A	White/Red d	General-purpose input 18		18B	White/Black d	General-purpose output 18	
19A	Yellow/Red d	General-purpose input 17		19B	Yellow/Blackc d	General-purpose output 17	
20A	Pink/Red d	General-purpose input 16		20B	Pink/Black d	General-purpose output 16	

Note1) Sink type:12V/24V(COM),Source type:0V(COM)

<Reference> The example of connection with our PLC

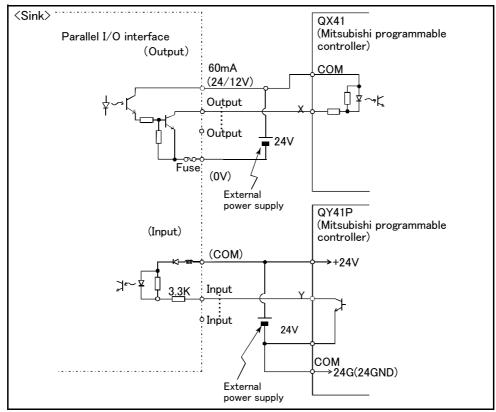


Table 3-19: Connection with a Mitsubishi PLC (Example of sink type)

*The input/output circuit external power supply (24 VDC) must be prepared by the customer.

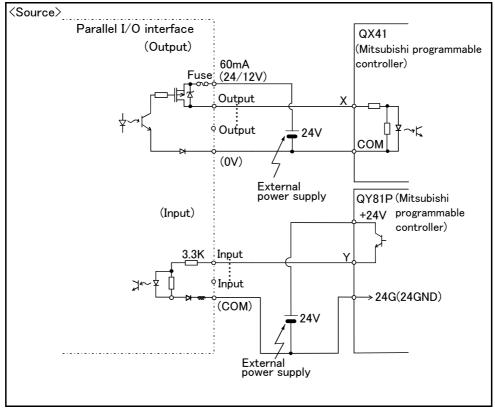


Table 3-20: Connection with a Mitsubishi PLC (Example of source type)

^{*}The input/output circuit external power supply (24 VDC) must be prepared by the customer.

(4) External I/O cable

■ Order type: ● 2D-CBL □□ Note) The numbers in the boxes □□ refer to the length. (05: 5m、15: 15m)

Outline



This is the dedicated cable used to connect an external peripheral device to the connector on the parallel I/O interface. For parallel I/O unit is another option 2A-CBL.**. One end matches the connector on the parallel input/output unit, and the other end is free. Connect the peripheral device's input/output signal using the free end. One cable correspond to the input 16 points and output 16 points.

Two cables are needed to connection of (input 32 points and output 32 points) with built-in standard.

■ Configuration

Table 3-21: Configuration device

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
External I/O cable	2D−CBL □□	1 pc.	0.7(5m) 1.84(15m)	5m or 15m

Note1) Mass indicates one set.

■ Specifications

Table 3-22: Specifications

Items	Specifications			
Number of cables x cable size	AWG #28 x 20P (40 pairs)			
Total length	5m、15m			

■ Connector pin numbers and cable colors

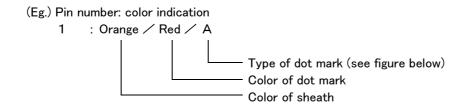
Table 3-23: Connector pin numbers and cable colors

Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors
1A/C	Orange/Red a	11A/C	Orange/Red c	1B/D	Orange/Black a	11B/D	Orange/Black c
2A/C	Gray/Red a	12A/C	Gray/Red c	2B/D	Gray/Black a	12B/D	Gray/Black c
3A/C	White/Red a	13A/C	White/Red c	3B/D	White/Black a	13B/D	White/Black c
4A/C	Yellow/Red a	14A/C	Yellow/Red c	4B/D	Yellow/Black a	14B/D	Yellow/Black c
5A/C	Pink/Red a	15A/C	Pink/Red c	5B/D	Pink/Black a	15B/D	Pink/Black c
6A/C	Orange/Red b	16A/C	Orange/Red d	6B/D	Orange/Black b	16B/D	Orange/Black d
7A/C	Gray/Red b	17A/C	Gray/Red d	7B/D	Gray/Black b	17B/D	Gray/Black d
8A/C	White/Red b	18A/C	White/Red d	8B/D	White/Black b	18B/D	White/Black d
9A/C	Yellow/Red b	19A/C	Yellow/Red d	9B/D	Yellow/Black b	19B/D	Yellow/Black d
10A/C	Pink/Red b	20A/C	Pink/Red d	10B/D	Pink/Black b	20B/D	Pink/Black d

Notes) Pin number of connector<1> are 1C, 2C,20C, 1D, 2D,20D, connector<2> are 1A, 2A,20A, 1B, 2B,20B.

■ Connections and outside dimensions

The sheath of each signal cable (40 lines) is color indicated and marked with dots. Refer to the cable color specifications in "Table 3-34Connector pin numbers and cable colors" when making the connections.



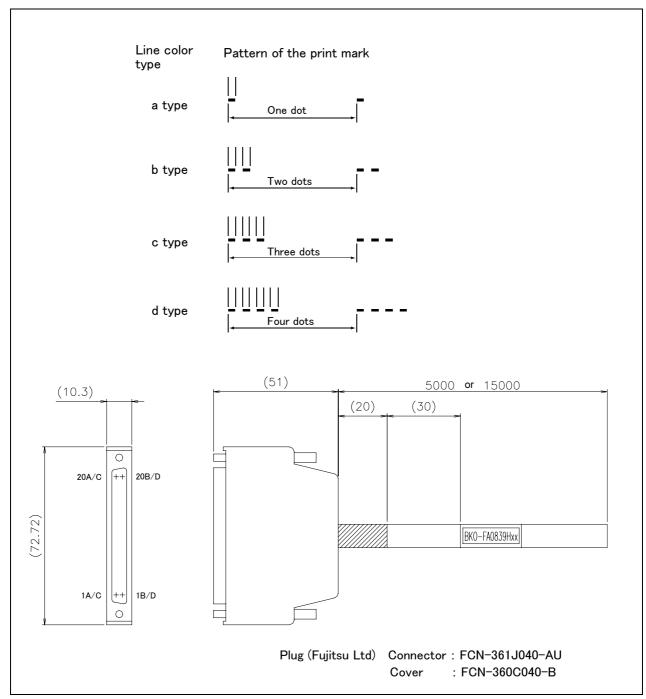


Fig.3-49: Connections and outside dimensions

(5) Parallel I/O unit

■ Order type: 2A-RZ361(Sink type)

2A-RZ371(Source type)

Outline



This is used to expand the external inputs and outputs. One one equal with this unit is built into the control unit among controllers the standard.

- The connection cable is not included. .Prepare the optional external input/output cable (2A-CBL05 or 2A-CBL15).
- Use 2A-RZ361 if the external input/output signal logic is of the sink type and 2A-RZ371 for source type signal logic.

Notes) Although the combined use with the parallel I/O interface (2D-TZ368) of another option is also possible, please use the setup of the station number by the different number separately. The station number is automatically fixed by the position of the option slot which installed the parallel I/O interface in 0-2.

■ Configuration

Table 3-24: Configuration device

Part name	Туре	Qty.	Mass(kg) Note1)	Remarks
Parallel I/O unit	2A-RZ361	Either one	0.7	Input/output 32 points/32 points
	2A-RZ371	pc.	0.7	2A-RZ361 is the sink type. 2A-RZ371 is the source type.
Robot I/O link connection connector	NETcable-1	2 sets	-	Connector with pins. The cable must be prepared and wired by the customer.
Power connection connector	DCcable-2	1 set	-	Connector with pins. The cable must be prepared and wired by the customer.
Terminator	R-TM	1 pc.	-	100 Ω (1/4W)

Note1) Mass indicates one set.

■ Specifications

- 1) The parallel I/O interface (2D-TZ368) of another option, and the a maximum of eight pieces in all. (One station occupies one unit.)
- 2) The power supply (24V) must be prepared by the customer and connected with the power connection cable (DCcable-2)

A separate 24V power supply is required for the input/output circuit wiring.

Table 3-25: Electrical specifications of input circuits

Item		Specification	Internal circuit		
Туре		DC input	⟨Sink type⟩		
Number of input poi	nts	32	.+24V/+12V		
Insulation method		Photo coupler insulation	(COM)		
Rated input voltage		12VDC/24VDC			
Rated input current		Approx 3mA/7mA	│		
Working voltage ran	ge	10.2 to 26.4VDC(Ripple factor should be less than 5%.)	Input		
ON voltage/ON curi	rent	8VDC or more/ 2mA or more	3.3K		
OFF voltage/ OFF of	current	4VDC or less/ 1mA or less	Source type		
Input resistance		Approx. 3.3kΩ	(Source cype)		
Response time	OFF-ON	10ms or less (24VDC)	3.3K Input		
ON-OFF		10ms or less (24VDC)			
Common method		8 points per common] ノベ文 以820		
External cable connection method		Connector			
			0V(COM)		

Table 3-26 : Electrical specifications for the output circuits

Item		Specification	Internal circuit
Туре		Transistor output	<sink type=""></sink>
No. of output po	ints	32	
Insulation metho	d	Photo-coupler insulation	
Rated load volta	ge	12VDC/24VDC	(24/12V)
Rated load volta	ge range	10.2 to 30VDC(peak voltage 30VDC)	1 1
Max. load curren	t	0.1A/point (100%)	Y Outline
Leakage current	at OFF	0.1mA or less	
Max. voltage dro	p at ON	0.9VDC(TYP.) Note1)	, Y <u> </u>
	OFF-ON	2ms or less (hardware response time)	Fuse (0V)
Response time	ON-OFF	2ms or less (Resistance load) (hardware response time)	⟨Source type⟩
Fuse rating	•	Fuse 3.2A (one per common) Replacement not possible	Fuse (24/12V)
Common method	I	8 points per common (common terminal: 4 points)	ı r□-Ækî Ĭ
External wire comethod	nnection	Connector	Outline
External power	Voltage	12VDC/24VDC(10.2 to 30VDC)	(0V)
supply	Current	60mA (TYP. 24VDC per common) (base drive current)	(01)

Note1) The maximum voltage drop value at signal ON Refer to it for the equipment connected to the output circuit.



The output circuit protective fuses prevent failure in case of load short-circuit and improper connections. Please do not connect loads that cause the current to exceed the maximum rated current. If the maximum rated current is exceeded, the internal transistors may be damaged.

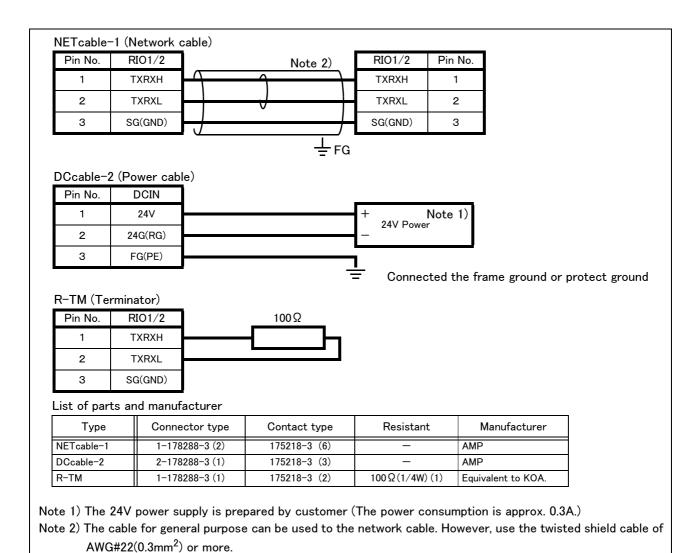


Fig.3-50: Spacifications for the connection cable

■ Installation method

The expansion parallel input/output unit is installed outside of the controller. Connect with the network connection cable (NETcable-1) from the RIO connector in the rear/into of the controller. (Terminator is connected at the time of shipment)

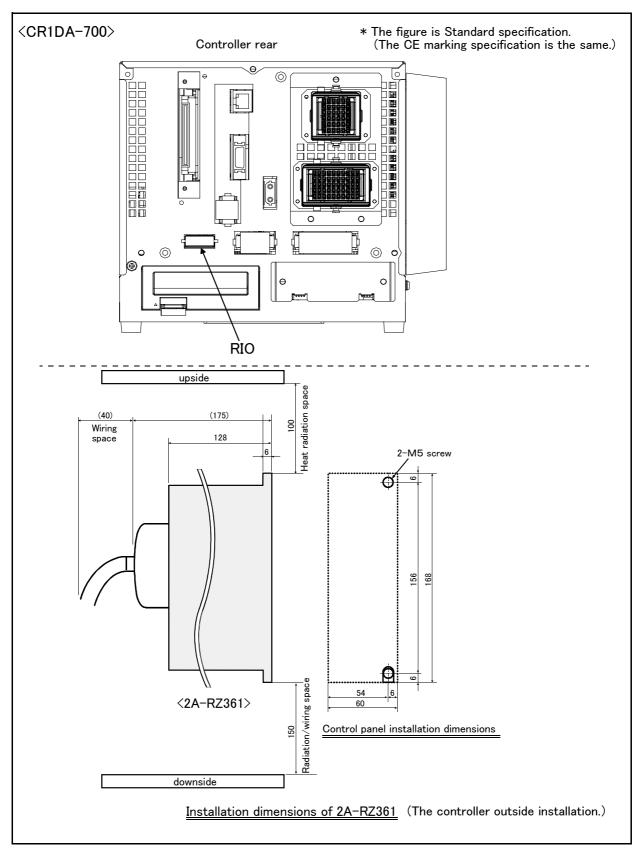


Fig.3-51: Installing the parallel I/O unit (CR1DA-700)

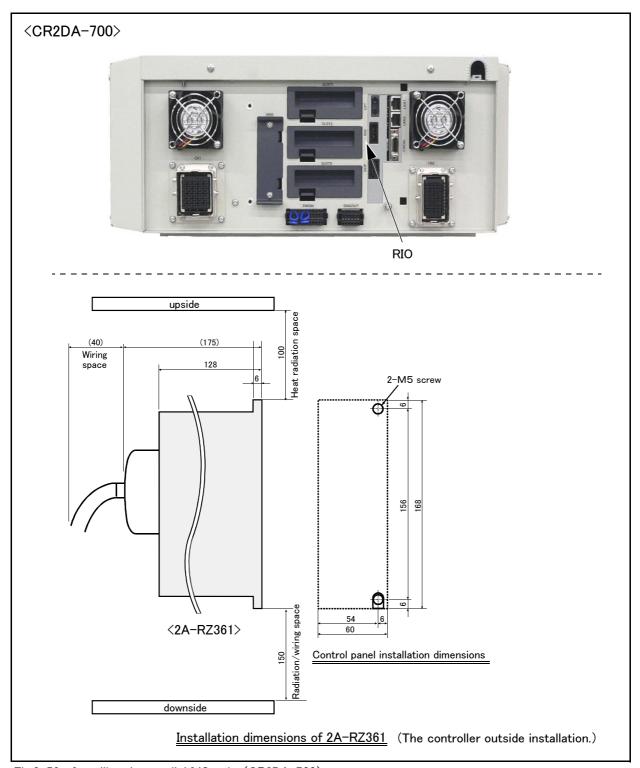


Fig.3-52 : Installing the parallel I/O unit (CR2DA-700)

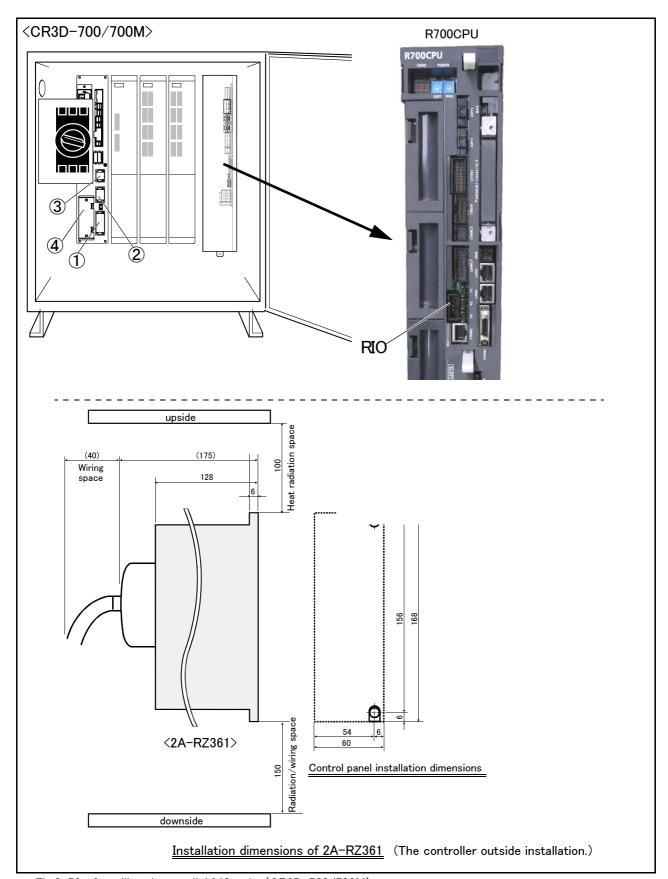


Fig.3-53 : Installing the parallel I/O unit (CR3D-700/700M)

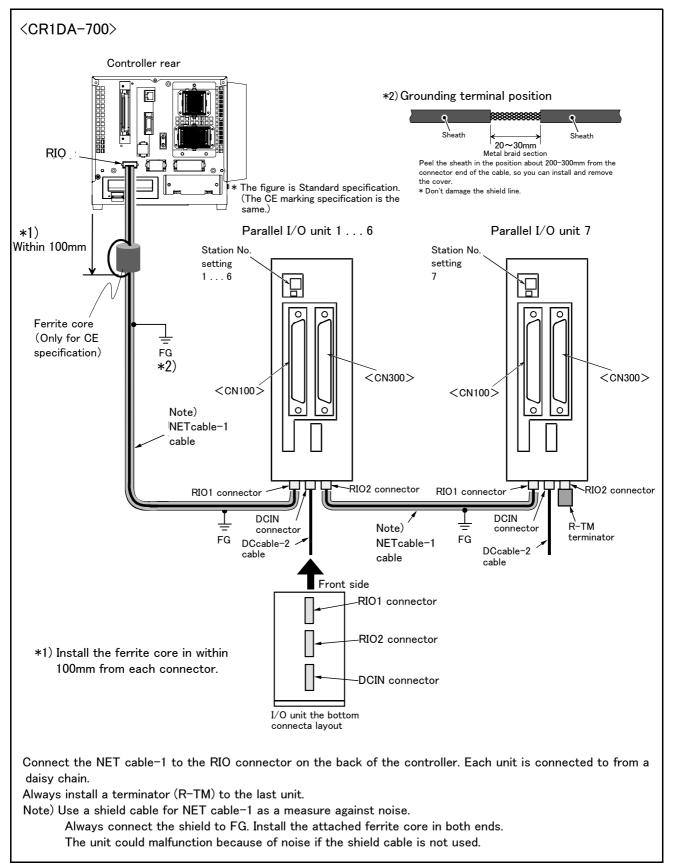


Fig.3-54: Connection method of expansion parallel I/O unit (CR1DA-700)

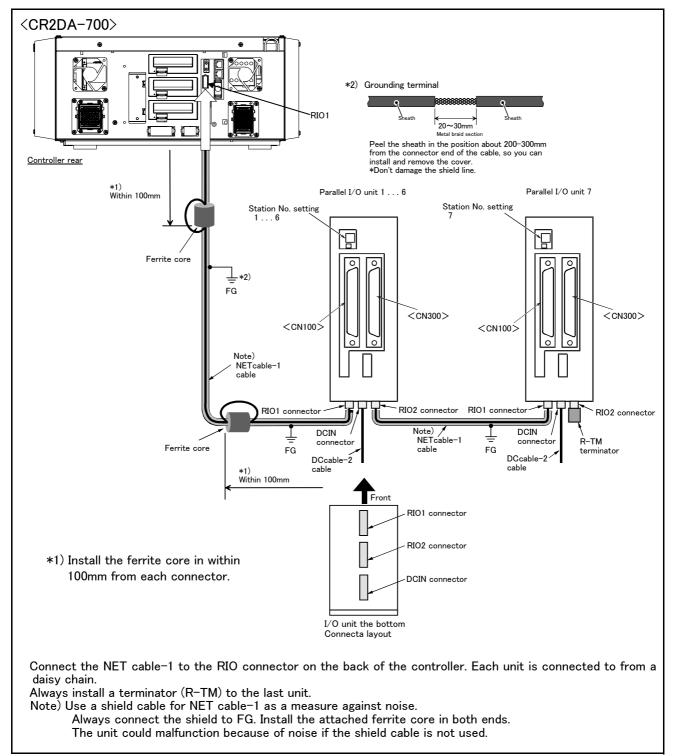


Fig.3-55: Connection method of expansion parallel I/O unit (CR2DA-700)

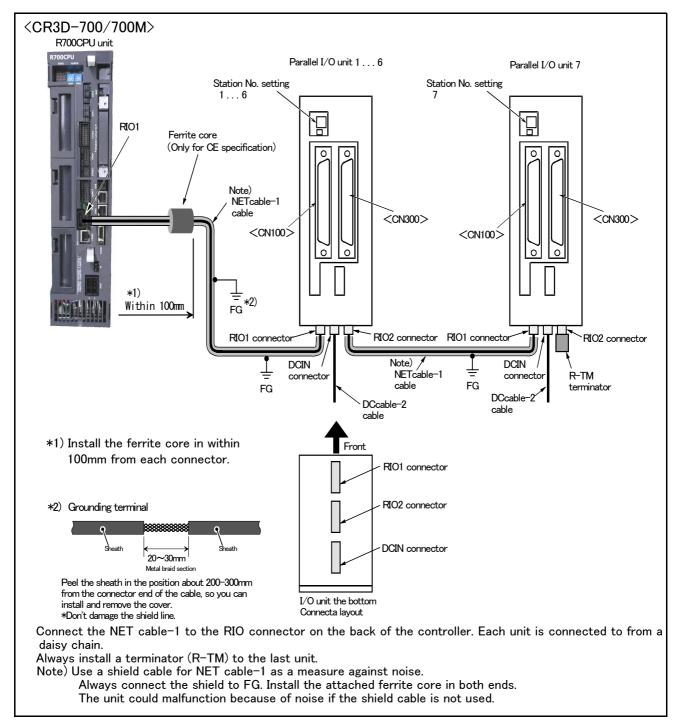
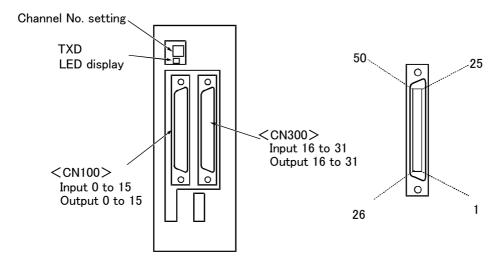


Fig.3-56: Connection method of expansion parallel I/O unit (CR3D-700/700M)

■ Pin arrangement of the connector



*2A-RZ361/2 A-RZ371 are 32/32 input-and-output units. (One-station occupancy)

Fig.3-57: Pin arrangement of the parallel I/O unit

■ Assignment of pin number and signal

The assignment range of the general-purpose input-and-output signal is fixed by the setup of the station number.

Table 3-27: Assignment of pin number and signal

Unit Number	Station number	CN100	CN300
1st set	0	Input : 0 to 15 Output : 0 to 15	Input : 16 to 31 Output : 16 to 31
2nd set	1	Input : 32 to 47 Output : 32 to 47	Input : 48 to 63 Output : 48 to 63
3rd set	2	Input : 64 to 79 Output : 64 to 79	Input : 80 to 95 Output : 80 to 95
4th set	3	Input : 96 to 111 Output : 96 to 111	Input : 112 to 127 Output : 112 to 127
5th set	4	Input : 128 to 143 Output : 128 to 143	Input : 144 to 159 Output : 144 to 159
6th set	5	Input : 160 to 175 Output : 160 to 175	Input : 176 to 191 Output : 176 to 191
7th set	6	Input : 192 to 207 Output : 192 to 207	Input : 208 to 223 Output : 208 to 223
8th set	7	Input: 224 to 239 Output: 224 to 239	Input : 240 to 255 Output : 240 to 255

The connector pin number of the parallel I/O unit of the station number 0 and signal number assignment are shown in Table 3-28 and Table 3-29. If it is set as other station number, please interpret and utilize.

■ Parallel I/O interface (First expansion unit)

Table 3-28 : Connector CN100pin No. and signal assignment list (2A-CBL $\Box\Box$)

	20.00	Function name		Pin	,	Function name		
Pin No.	Line color	General-purpose	Dedicated/power supply, common	No.	Line color	General-purpose	Dedicated/power supply, common	
1	Orange/Red A		FG	26	Orange/Blue A		FG	
2	Gray/Red A		0V:For pins 4-7, 10-13	27	Gray/Blue A		0V:For pins 29-32, 35-38	
3	White/Red A		12V/24V:For pins 4-7	28	White/Blue A		12V/24V:For pins 29-32	
4	Yellow/Red A	General-purpose output 0	Operating output Note1)	29	Yellow/Blue A	General-purpose output 4		
5	Pink/Red A	General-purpose output 1	In servo ON output signal Note1)	30	Pink/Blue A	General-purpose output 5		
6	Orange/Red B	General-purpose output 2	Error occurring output signal Note1)	31	Orange/Blue B	General-purpose output 6		
7	Gray/Red B	General-purpose output 3	Operation rights output sig- nal Note1)	32	Gray/Blue B	General-purpose output 7		
8	White/Red B		0V:For pins 4-7, 10-13	33	White/Blue B		0V:For pins 29-32, 35-38	
9	Yellow/Red B		12V/24V:For pins 10-13	34	Yellow/Blue B		12V/24V:For pins 35-38	
10	Pink/Red B	General-purpose output 8		35	Pink/Blue B	General-purpose output 12		
11	Orange/Red C	General-purpose output 9		36	Orange/Blue C	General-purpose output 13		
12	Gray/Red C	General-purpose output 10		37	Gray/Blue C	General-purpose output 14		
13	White/Red C	General-purpose output 11		38	White/Blue C	General-purpose output 15		
14	Yellow/Red C		COM0:For pins 15-22 Note2)	39	Yellow/Blue C		COM1:For pins 40-47 Note2)	
15	Pink/Red C	General-purpose input 0	Stop input ^{Note3)}	40	Pink/Blue C	General-purpose input 8		
16	Orange/Red D	General-purpose input 1	Servo OFF input signal Note1)	41	Orange/Blue D	General-purpose input 9		
17	Gray/Red D	General-purpose input 2	Error reset input signal Note1)	42	Gray/Blue D	General-purpose input 10		
18	White/Red D	General-purpose input 3	Start input ^{Note1)}	43	White/Blue D	General-purpose input 11		
19	Yellow/Red D	General-purpose input 4	Servo ON input signal ^{Note1)}	44	Yellow/Blue D	General-purpose input 12		
20	Pink/Red D	General-purpose input 5	Operation rights input sig- nal Note1)	45	Pink/Blue D	General-purpose input 13		
21	Orange/Red E	General-purpose input 6		46	Orange/Blue E	General-purpose input 14		
22	Gray/Red E	General-purpose input 7		47	Gray/Blue E	General-purpose input 15		
23	White/Red E		Reserved	48	White/Blue E		Reserved	
24	Yellow/Red E		Reserved	49	Yellow/Blue E		Reserved	
25	Pink/Red E		Reserved	50	Pink/Blue E		Reserved	

Note1) The dedicated signal is assigned at shipping. It can change with the parameter. Note2) Sink type: 12V/24V(COM), Source type: 0V(COM)

Note3) The dedicated input signal (STOP) is assigned at shipping. The signal number is fixing.

Table 3-29 : Connector CN300pin No. and signal assignment list (2A-CBL $\Box\Box$)

Pin			on name	Pin	·		Function name	
No.	Line color	General-purpose	Dedicated/power supply, common	No.	Line color	General-purpose	Dedicated/power supply, common	
1	Orange/Red A		FG	26	Orange/Blue A		FG	
2	Gray/Red A		0V:For pins 4−7, 10−13	27	Gray/Blue A		0V:For pins 29-32, 35-38	
3	White/Red A		12V/24V:For pins 4-7	28	White/Blue A		12V/24V:For pins 29-32	
4	Yellow/Red A	General-purpose output 16		29	Yellow/Blue A	General-purpose output 20		
5	Pink/Red A	General-purpose output 17		30	Pink/Blue A	General-purpose output 21		
6	Orange/Red B	General-purpose output 18		31	Orange/Blue B	General-purpose output 22		
7	Gray/Red B	General-purpose output 19		32	Gray/Blue B	General-purpose output 23		
8	White/Red B		0V:For pins 4−7, 10−13	33	White/Blue B		0V:For pins 29-32, 35-38	
9	Yellow/Red B		12V/24V:For pins 10-13	34	Yellow/Blue B		12V/24V:For pins 35-38	
10	Pink/Red B	General-purpose output 24		35	Pink/Blue B	General-purpose output 28		
11	Orange/Red C	General-purpose output 25		36	Orange/Blue C	General-purpose output 29		
12	Gray/Red C	General-purpose output 26		37	Gray/Blue C	General-purpose output 30		
13	White/Red C	General-purpose output 27		38	White/Blue C	General-purpose output 31		
14	Yellow/Red C		COM0:For pins 15-22 ^{Note1)}	39	Yellow/Blue C		COM1:For pins 40-47 Note1)	
15	Pink/Red C	General-purpose input 16		40	Pink/Blue C	General-purpose input 24		
16	Orange/Red D	General-purpose input 17		41	Orange/Blue D	General-purpose input 25		
17	Gray/Red D	General-purpose input 18		42	Gray/Blue D	General-purpose input 26		
18	White/Red D	General-purpose input 19		43	White/Blue D	General-purpose input 27		
19	Yellow/Red D	General-purpose input 20		44	Yellow/Blue D	General-purpose input 28		
20	Pink/Red D	General-purpose input 21		45	Pink/Blue D	General-purpose input 29		
21	Orange/Red E	General-purpose input 22		46	Orange/Blue E	General-purpose input 30		
22	Gray/Red E	General-purpose input 23		47	Gray/Blue E	General-purpose input 31		
23	White/Red E		Reserved	48	White/Blue E		Reserved	
24	Yellow/Red E		Reserved	49	Yellow/Blue E		Reserved	
25	Pink/Red E		Reserved	50	Pink/Blue E		Reserved	

Note1) Sink type:12V/24V(COM),Source type:0V(COM)

<Reference> The example of connection with our PLC

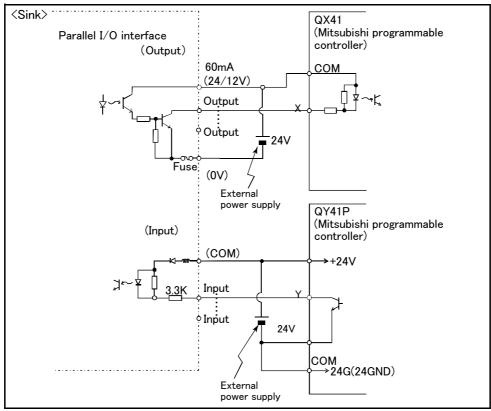


Table 3-30: Connection with a Mitsubishi PLC (Example of sink type)

*The input/output circuit external power supply (24 VDC) must be prepared by the customer.

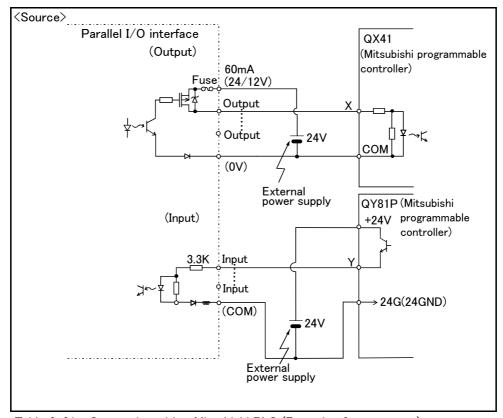


Table 3-31: Connection with a Mitsubishi PLC (Example of source type)

^{*}The input/output circuit external power supply (24 VDC) must be prepared by the customer.

(6) External I/O cable

■ Order type: 2A-CBL □□ Note) The numbers in the boxes □□ refer to the length. (05: 5m、15: 15m)

Outline



This is the dedicated cable used to connect an external peripheral device to the connector on the parallel input/output unit.

One end matches the connector on the parallel input/output unit, and the other end is free. Connect the peripheral device's input/output signal using the free end.

One cable correspond to the input 16 points and output 16 points.

Two cables are needed to connection of (input 32 points and output 32 points) with built-in standard.

■ Configuration

Table 3-32: Configuration device

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
External I/O cable	2A-CBL □□	1pc.	0.7(5m) 1.84(15m)	5m or 15m

Note1) Mass indicates one set.

■ Specifications

Table 3-33: Specifications

Items	Specifications
Number of cables x cable size	50 pairs x AWG #28
Total length	5m or 15m

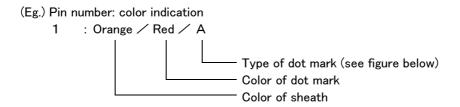
■ Connector pin numbers and cable colors

Table 3-34: Connector pin numbers and cable colors

Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors	Pin no.	Cable colors
1	Orange/Red A	11	Orange/Red C	21	Orange/Red E	31	Orange/Blue B	41	Orange/Blue D
2	Gray/Red A	12	Gray/Red C	22	Gray/Red E	32	Gray/Blue B	42	Gray/Blue D
3	White/Red A	13	White/Red C	23	White/Red E	33	White/Blue B	43	White/Blue D
4	Yellow/Red A	14	Yellow/Red C	24	Yellow/Red E	34	Yellow/Blue B	44	Yellow/Blue D
5	Pink/Red A	15	Pink/Red C	25	Pink/Red E	35	Pink/Blue B	45	Pink/Blue D
6	Orange/Red B	16	Orange/Red D	26	Orange/Blue A	36	Orange/Blue C	46	Orange/Blue E
7	Gray/Red B	17	Gray/Red D	27	Gray/Blue A	37	Gray/Blue C	47	Gray/Blue E
8	White/Red B	18	White/Red D	28	White/Blue A	38	White/Blue C	48	White/Blue E
9	Yellow/Red B	19	Yellow/Red D	29	Yellow/Blue A	39	Yellow/Blue C	49	Yellow/Blue E
10	Pink/Red B	20	Pink/Red D	30	Pink/Blue A	40	Pink/Blue C	50	Pink/Blue E

■ Connections and outside dimensions

The sheath of each signal cable (50 lines) is color indicated and marked with dots. Refer to the cable color specifications in "Table 3-34Connector pin numbers and cable colors" when making the connections.



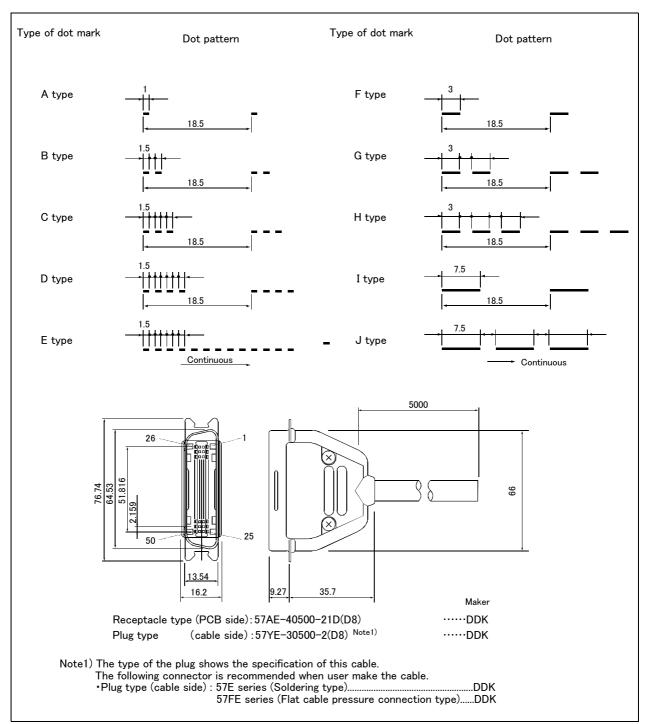


Fig.3-58: Connections and outside dimensions

(7) Personal computer cable

■ Order type: ● For PC/AT: 2D-232CBL03M

Outline



This is the RS-232 interface cable used for connecting the controller with a personal computer. The personal computer on hand may be usable with the above interface cable. Confirm the connection specifications when placing an order.

Personal computer cables for the PC/AT compatible model is available.

■ Configuration

Table 3-35: Configuration device

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
Personal computer cable (for PC/AT)	2D-232CBL03M	1pc.	4	3m, D-SUB 9 pin

Note1) Mass indicates one set.

■ Specifications

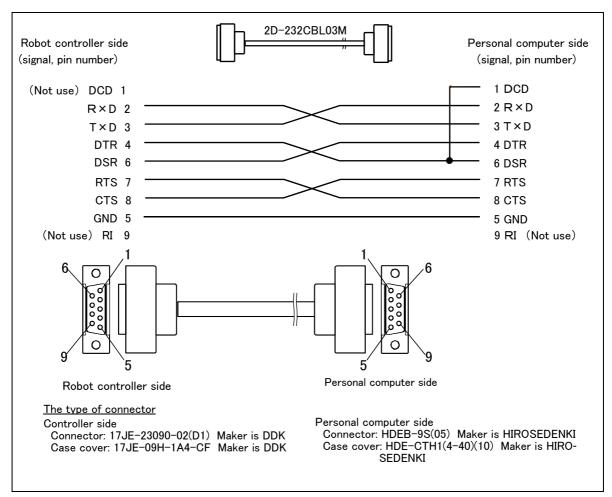


Fig.3-59: Personal computer cabe connection

(8) CC-Link interface

■ Order type: ● 2D-TZ576

■ Outline



The CC-Link interface is the optioninterface to not only add bit data to the robot controller. but also to add CC-Link field network function that allows cyclic transmission of word data.

■ Configuration

Table 3-36: Configuration device

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
CC-Link interface	2D-TZ576	1	0.4	
Manual	BFP-A8701	1	-	
Ferrite core	E04SR301334	2	-	
Cable clamp	AL4	2	-	Be sure to install this for noise countermeasure.
	AL5	2	-	

Note1) Mass indicates one set.

Table 3-37: Procured by the customer

Part name	Туре	Qty.	Remarks	
	QJ61BT11(Q series)			
	QJ61BT11N(Q series)			
	AJ61QBT11(QnA series)			
Master station	A1SJ61QBT11(QnAS series)	1	FX series products are not supported.	
	AJ61BT11(A series)			
	A1SJ61BT11(AnS series)			
	A80BD-J61BT11(personal computer board)			
Communication cable	-	1	Shielded 3-core twisted cable This cable may be manufactured by the customer.	
Terminal resistor	-	1	110 Ω or 130 Ω is recommended.	

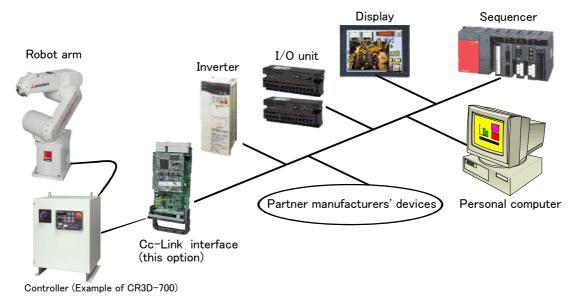


Fig.3-60: Example of CC-Link Product Configuration

■ Specifications

Table 3-38 : Specifications

Item			Specif	ications		Remarks	
Communication function		Bit data	and word da	ita can be tr	ansmitted.	Word data are used by the registers.	
Station type		Int	elligent devi	ce station ^N	ote1)		
Support station			Local	station		No master station function	
The version	n correspondin	ng to CC-Link		٧	er.2		The extended cyclic setup is possible.
Mountable	option slot			Slot	1, 2, 3		
Number of	mountable CC	Link interface cards			1		Multiple CC-Link interface cards cannot be inserted.
Number of	stations			1 to 64	stations		When four stations are occupied, continuous station numbers are used. The station numbers are set by a DIP switch.
Transmissio	on speed		101	M/5M/2.5M	/625K/156K	bps	This is set by the rotary SW.
Station nun	mber			1 t	o 64		When two or more stations are occupied,
Number of	occupied stati	ons		1/2	2/3/4		continuous station numbers are used.
Extended c	yclic setup			1/2	2/4/8		
Maximum li	nk point	Remote I/O (RX, RY).		Each 8	96 points		The two last cannot be used.
		Remote register (RWr, RWw)		Each 12	8 register		16 bits/register
Extended c	yclic setup	-	1 fold setup	2 fold setup	3 fold setup	4 fold setup	
Link point per set	When one station is	Remote I/O (RX, RY).	32 point	32 point	64 point	128 point	
	occupied	Remote register (RWw)	4 word	8 word	16 word	32 word	
		Remote register (RWr)	4 word	8 word	16 word	32 word	
	When two stations is	Remote I/O (RX, RY).	64 point	96 point	192 point	384 point	
	occupied	Remote register (RWw)	8 word	16 word	32 word	64 word	
		Remote register (RWr)	8 word	16 word	32 word	64 word	
	When three stations is	Remote I/O (RX, RY).	96 point	160 point	320 point	640 point	
	occupied	Remote register (RWw)	12 word	24 word	48 word	96 word	
		Remote register (RWr)	12 word	24 word	48 word	96 word	
	When four stations is	Remote I/O (RX, RY).	128 point	224 point	448 point	896 point	
oc	occupied	Remote register (RWw)	16 word	32 word	64 word	128 word	
Remote register (RWr)		16 word 32 word 64 word 128 word			128 word		
Number of	the maximum	occupancy station		4 st	ations		
The I/O fire	st number of t	he robot controller.		nber corresp r by the set	6000 conding to th up of the pa CFIX."		

Note1) The CC-Link interface supports neither the transient transmission function nor the FX series.

■ Functions

(1) Communication function

• The number of usable points is 896 points maximum for bit control and 128 points maximum for word control.

(2) Easy setup

- The CC-Link interface card can be set by a rotary switch or DIP switch.
- •No separate space is required to mount the CC-Link interface card as it is embedded in the robot controller (can only be mounted into slot 2).
- Easy wiring since only four terminals need to be connected.
- Dedicated commands have been added to MELFA-BASIC V (robot programming language); thus, no complex interface programming is required.

(3) High-speed response

- The link scan time when connecting 64 stations is approximately 7.2 ms, achieving superior high-speed response performance.
- A transmission speed can be selected from 10M, 5M, 2.5M, 625K and 156K bps according to the transmission distance.

(9) Extension memory cassette

■ Order type: ● 2D-TZ454

Outline



Used to increase the total number of teaching points in the robot program.

■ Configuration

Table 3-39: Configuration device

Part name	Туре	Qty.	Mass(kg) ^{Note1)}	Remarks
Extension memory cassette	2D-TZ454	1	0.1	

Note1) Mass indicates one set.

■ Specifications

Table 3-40: Specifications

Items	Specifications	Remarks	
External dimensions	Approx. 94(W)X65(D)X15(H) mm	Excluding the connection connector	
Mass	Approx. 0.2 kg		
Connection method	Connection using a special connector		
Memory size Note1)	Teaching point number: 37,800 Steps number: 75,600 Program number: 256	The sum total value combined with the standard are Teaching point number: 50,800 Steps number: 101,600 Program number: 512	
Backup	Backup using the controller's internal battery		

Note1) As for the standard points, after adding an expansion memory cassette, the information in all backup memory areas in the controller is copied into the expansion memory cassette. Therefore, please note that if the expansion memory cassette is removed after it has been added, there will be no program left in the controller.

[CAUTION]

· Inserting and removing the memory cassette

A memory cassette cannot be inserted or removed while the control power is on. Please turn off the control power before handling the memory cassette to avoid destroying the memory information in the cassette.

(10) RT ToolBox2/RT ToolBox2 mini

■ Order type : ● RT ToolBox2

*For windows CD-ROM : 3D-11C-WINE

● RT ToolBox2 mini

*For windows CD-ROM : 3D-12C-WINE

Outline



This is handy software that fully uses the personal computer functions. It can be used in various stages from the robot specifications study (tact study, etc.) to the design support (creation and editing of programs), start up support (execution, control and debugging of program), and maintenance (remote maintenance.)

The "personal computer support software" which supports these function fully, and the "personal computer support software mini" which does not have the simulation function are available.

■ Configuration

Table 3-41: Product configuration

Part name	Туре	Medium	Mass(kg) ^{Note1)}	Remarks
RT ToolBox2	3D-11C-WINE	CD-ROM	0.2	
RT ToolBox2 mini	3D-12C-WINE	CD-ROM	0.2	

Note1) Mass indicates one set.

■ Features

(1) Simple operation with guidance method and menu method

The Windows standard is used for windows operation, so the controller initialization and startup operations can be carried out easily by following the instructions given on the screen. Even a beginner can easily carry out the series of operations from program creation to execution.

(2) Increased work efficiency with ample support functions

The work efficiency is greatly improved with the multi-window method that carries out multiple steps and displays in parallel. The renumbering function, and copy, search, syntax check and step execution are especially sufficient, and are extremely useful when editing or debugging the program.

With the simulation function support, the program can be debugged and the tact checked before starting the machine at the site. This allows the on-site startup work efficiently to be greatly improved.

- (3) The maintenance forecast function increases the efficiency of maintenance work. Analyze the load condition while the robot is actually operating. Based on this analysis, calculate the time for maintenance, such as lubrication and belt replacement. By utilizing this information, the line stop time as well as the maintenance costs can be reduced.
- (4) The position recovery support function increases the recovery efficiency in the event of origin position displacement. This function compensates the origin settings and position data by just reproducing several previous teaching points when hand and/or arm displacement occurs, when replacing the motor and the belts, or when reloading the robot. This function can reduce the time required for recovery.

■ Functions

Table 3-42 : Functions

Function Compatible model		Functional existence Note1)		Details	
		0	0	Personal computer running Microsoft Windows2000/XP/Vista.	
Program editing functions	Editing functions	0	0	MELFA BASIC V language compatible Multiple editing screen simultaneously display Command input, comment writing Position data editing File operation (writing to controller, floppy disk, personal computer) Search and replace function (using characters, line Nos., labels) Copy, cut, paste, insert (per character, line), undo (per command statement, position conversion) Line No. automatic generation, renumbering Batch syntax check Command template Position conversion batch editing Position variable template Print, print preview	
	Control functions	0	0	Program file control (list, copy, movement, delete, content comparison, name change, protect)	
	Debugging functions	0	0	Direct editing of program in controller Confirmation of robot program operation (step execution, direct execution)	
Simulation function		0	×	Off-line simulation of robot program operation using CG (computer graphics) Tact time calculation	
Monitor functions		0	0	Robot operation monitor (robot operation state, stop signal, error monitor, program monitor (execution program, variables), general-purpose input/output signals (forced output possible), dedicated input/output signals, operation confirmation (operation range, current position, hand, etc.) Operation monitor (working time statistics, production information, robot version) Servo monitor (load)	
Maintenance function		0	0	Parameter setting Batch, divided backup	
				- RT ToolBox2 mini (3D-12C-WINE) - RT ToolBox2 (3D-11C-WINE)	

Note1) The functions included with the RT ToolBox2 and the RT ToolBox2 mini are shown below.

O : Function provided X: Function not provided

(11) Instruction Manual(bound edition)

■ Order type: ● 5S-DD00-PE01 (RH-6SDH/12SDH/18SDH/20SDH series)

• 5S-DL00-PE01 (RH-3SDHR series)

Outline



This is a printed version of the CD-ROM (instruction manual) supplied with this product.

■ Configuration

Table 3-43: Product configuration (RH-6SDH/12SDH/18SDH/20SDH series)

Name	Туре	Mass(kg) ^{Note1)}	Specifications			
struction Manual	5S-DD00-PE01	2.6				
Safety Manual	BFP-A8006	-	Items relating to safety in handling the robot			
Standard Specifications	BFP-A8658	-	Specification of the robot arm and controller			
Robot Arm Setup & Maintenance	BFP-A8659	-	Installation method of the robot arm, jog operation, and maintenance and inspection procedures			
Controller Setup, Basic Operation and Maintenance	BFP-A8660	-	Installation method of the controller, basic operation, and maintenance and inspection procedures			
Detailed Explanation of Functions and Operations	BFP-A8586	-	Functions of the controller and T/B, operation method and explanation of MELFA-BASIC V			
Troubleshooting	BFP-A8588	-	Causes of errors occurred and their countermeasures			
Additional axis function	BFP-A8663	-	Function of the additional axis, operation method.			
Tracking Function Manual	BFP-A8664	-	Function of the Tracking, operation method.			

Note1) Mass indicates one set.

Table 3-44: Product configuration (RH-3SDHR series)

Name	Туре	Mass(kg) ^{Note1)}	Specifications
nstruction Manual	5S-DL00-PE01	2.6	
Safety Manual	BFP-A8006	-	Items relating to safety in handling the robot
Standard Specifications	BFP-A8658	-	Specification of the robot arm and controller
Robot Arm Setup & Maintenance	BFP-A8839	-	Installation method of the robot arm, jog operation, and maintenance and inspection procedures
Controller Setup, Basic Operation and Maintenance	BFP-A8660	-	Installation method of the controller, basic operation, and maintenance and inspection procedures
Detailed Explanation of Functions and Operations	BFP-A8586	-	Functions of the controller and T/B, operation method and explanation of MELFA-BASIC V
Troubleshooting	BFP-A8588	-	Causes of errors occurred and their countermeasures
Additional axis function	BFP-A8663	-	Function of the additional axis, operation method.
Tracking Function Manual	BFP-A8664	-	Function of the Tracking, operation method.

Note1) Mass indicates one set.

3.10 Maintenance parts

The consumable parts used in the controller are shown in Table 3–45. Purchase these parts from your dealer when required. Some Mitsubishi-designated parts differ from the maker's standard parts. Thus, confirm the part name, robot arm and controller serial No. and purchase the parts from your dealer.

Table 3-45: Controller consumable parts list

No.	Name	Type Note1)	Qty.	Usage place	Supplier
CR1DA	-700 series controller				•
1	Lithium battery	Mitsubishi Electric Sys-			
2	Filter		1	Front of the controller	tem Service;Co.,Ltd
CR2DA	-700 controller				
1	Lithium battery	Q6BAT	1	Front operation panel	Mitsubishi Electric Sys-
2	Filter		1	Front of the controller	tem Service;Co.,Ltd
CR3D-	700 controller				
1	Lithium battery	Q6BAT	1	Front operation panel	
2	Fan (40 square)		5	Amplifier unit Converter unit	Mitsubishi Electric Sys-
3	Fan (90 square)		1	Control unit	tem Service;Co.,Ltd
4	Filter		1	Controller rear]

Note1) Confirm the robot arm serial No., and contact the dealer or service branch of Mitsubishi Electric Co., for the type.

4 Software

4.1 List of commands

The available new functions in MELFA-BASIC V are given in Table 4-1.

Table 4-1: List of MELFA-BASIC V commands

Туре	Class	Function	Input format (example)
	Joint interpolation	Moves to the designated position with joint interpolation.	Mov P1
	Linear interpolation	Moves to the designated position with linear interpolation.	Mvs P1
	Circular interpolation	Moves along a designated arc (start point \rightarrow passing point \rightarrow start point (end point)) with 3-dimensional circular interpolation (360 degrees).	Mvc P1,P2,P1
		Moves along a designated arc (start point \to passing point \to end point) with 3-dimensional circular interpolation.	Mvr P1,P2,P3
		Moves along the arc on the opposite side of a designated arc (start point \rightarrow reference point \rightarrow end point) with 3-dimensional circular interpolation.	Mvr2 P1,P9,P3
		Moves along a set arc (start point \rightarrow end point) with 3-dimensional circular interpolation.	Mvr3 P1,P9,P3
	Speed designation	Designates the speed for various interpolation operations with a percentage (0.1% unit).	Ovrd 100
		Designate the speed for joint interpolation operation with a percentage $(0.1\%$ unit).	JOvrd 100
		Designates the speed for linear and circular interpolation with a numerical value (mm/s unit).	Spd 123.5
_		Designates the acceleration/deceleration time as a percentage in respect to the predetermined maximum acceleration/deceleration. (1% unit)	Accel 50,80
contr		Automatically adjusts the acceleration/deceleration according to the parameter setting value.	Oadl ON
Position and operation control		ets the hand and work conditions for automatic adjustment of the acceleration/deceleration.	LoadsetT 1,1
Ser	Operation	Performance of movement is upgraded corresponding to the application.	MvTune 4
0 7		Adds a process unconditionally to the operation.	Wth
anc		Adds a process conditionally to the operation.	Wthif
on		Designates smooth operation.	Cnt 1,100,200
siti		Designates the positioning completion conditions with a No. of pulses.	Fine 200
Ро		Designates the positioning completion conditions with a joint interpolation.	Fine 0.5, J, 2
		Designates the positioning completion conditions with a distance in a straight line	Fine 1, P
		Turns the servo power ON/OFF for all axes.	Servo OFF
		Limits the operation of each axis so that the designated torque is not exceeded.	Torq 4,10
	Position control	Designates the base conversion data.	Base P1
		Designates the tool conversion data.	Tool P1
	Float control	The robot arm rigidity is lowered and softened. (XYZ coordinate system)	Cmp Pos ,&B00000011
		The robot arm rigidity is lowered and softened. (JOINT coordinate system) $ \\$	Cmp Jnt ,&B00000011
		The robot arm rigidity is lowered and softened. (TOOL coordinate system) $ \\$	Cmp Tool ,&B00000011
		The robot arm rigidity is returned to the normal state.	Cmp Off
		The robot arm rigidity is designated.	Cmpg 1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0
	Pallet	Defines the pallet.	Def Plt 1,P1,P2,P3,P4,5,3,1
		Operates the pallet grid point position.	Plt 1,M1
	Singular point pas- sage	Move to a specified position using linear interpolation passing through a singular point.	Mvs P1 TYPE 0,2

Туре	Class	Function	Input format (example)
	Branching	Branches unconditionally to the designated place.	GoTo 120
		Branches according to the designated conditions.	If M1=1 Then GoTo *L100
			Else GoTo 20
			End If
		Repeats until the designated end conditions are satisfied.	For M1=1 TO 10
			Next M1
		Repeats while the designated conditions are satisfied.	While M1<10
			Wend
		Branches corresponding to the designated expression value.	On M1 GoTo *La1, *Lb2, *Lc3
		Executes program block corresponding to the designated expression	Select
		value	Case 1
			Break
			Case 2
			Break End Select
Program control		Moves the program process to the next line.	Skip
วอก	Impact detection	Set to enable/disable the impact detection.	ColChk ON/OFF
Ę		Set the detection level of the impact detection.	ColLvl 100,80,,,,,
ogra	Subroutine	Executes the designated subroutine. (Within program)	GoSub *L200
Pro		Returns from the subroutine.	Return
		Executes the designated program.	CallP "P10",M1,P1
		Defines the program argument executed with the CALLP command.	FPrm M10,P10
		Executes the subroutine corresponding to the designated expression value.	On M1 GoSub *La1, *Lb2, *Lc3
	Interrupt	Defines the interrupt conditions and process.	Def Act 1, M1=1 GoTo *L100
	interrupt	Enables/disables the interrupt.	Act 1=1
		Defines the start line of the program to be executed when an interrupt is	
		generated from the communication line.	On Com(1) GoSub *L100
		Enables the interrupt from the communication line.	Com(1) On
		Disables the interrupt from the communication line.	Com(1) Off
		Stops the interrupt from the communication line.	Com(1) Stop
	Wait	Designates the wait time, and the output signal pulse output time. (0.01s unit)	Dly 0.5
		Waits until the variable becomes the designated value.	Wait M In(1)=1
	Stop	Stops the program execution.	Hlt
	- - -	Generates an error. During program execution, continue, stop or servo	
		OFF can be designated.	Error 9000
	End	Ends the program execution.	End
p	Hand open	Opens the designated hand.	HOpen 1
Hand	Hand close	Closes the designated hand.	HClose 1
	Assignment	Defines the input/output variables.	Def IO PORT1=BIT,0
ıtpu	Input	Retrieves the general-purpose input signal.	M1=M_In(1)
,/oL	Output	Calls out the general-purpose output signal.	
Input/output	·		M_Out(1) =0
	Mechanism designa-	Acquires the mechanism with the designated mechanism No.	GetM 1
tior	tion	Releases the mechanism with the designated mechanism No.	RelM 1
ecn	Selection	Selects the designated program for the designated slot.	XLoad 2,"P102"
ë	Start/stop	Carries out parallel execution of the designated program.	XRun 3,"100",0
le le		Stops parallel execution of the designated program.	XStp 3
Parallel execution		Returns the designated program's execution line to the head and enters	XRst 3
		the program selection enabled state.	Alter 0

Туре	Class	Function	Input format (example)		
	Definition	Defines the integer type or real number type variable.	Def Inte KAISUU		
		Defines the character string variable.	Def Char MESSAGE		
		efines the layout variable. (Up to 3-dimensional possible)	Dim PDATA(2,3)		
		Defines the joint variable.	Def Jnt TAIHI		
		Defines the position variable.	Def Pos TORU		
		Defines the function.	Def FN TASU(A,B)=A+B		
Others	Clear	Clears the general-purpose output signal, variables in program, variables	Clr 1		
₹		between programs, etc.	Oli 1		
	File	Opens a file.	Open "COM1:" AS #1		
		Closes a file.	Close #1		
		Inputs data from a file.	Input# 1,M1		
		Outputs data to a file.	Print# 1,M1		
	Comment	Describes a comment.	Rem "ABC"		
	Label	Indicates the branching destination.	*SUB1		

4.2 List of parameters

show the main parameter in the Table 4-2.

Table 4-2 : List of parameters

Parameter		Details
Standard tool coordinates.	MEXTL	Set the default value for the tool data. Unit: mm or deg.
Standard base coordinates	MEXBS	Set the relation of the world coordinate system and robot coordinate system. Unit: mm or deg.
XYZ operation range	MEPAR	Designate the overrun limit value for the world coordinate system.
JOINT operation range	MEJAR	Set the overrun limit value for each joint axis.
Free plane limit		This is the overrun limit set with the free plane. Create a plane with the three coordinates x1, y1, z1 to x3, y3, z3, and set the outer side of the plane as the outside operation range (error). The following three types of parameters are used.
	SFC1P	Eight types of free plane limits can be set in SFC1P to SFC8P.
	: SFC8P	There are nine elements, set in the order of x1, y1, z1, x2, y2, z2, x3, y3, z3.
	SFC1ME	Designate which mechanism to use eight types of set free plane limits. The mechanism No. to use is set with 1 to 3.
	SFC8ME	The medianism No. to use is set with 1 to 3.
	SFC1AT	Set the validity of the eight types of set free plane limits.
	: SFC8AT	(Valid 1/Valid 2/invalid = 1/-1/0)
User-defined area		An area (cube) defined with two XYZ coordinate points can be designated and that area set as the outside operation range. Furthermore, a signal can be output when the axis enters that area. Up to 32 types of area can be designated.
	AREA1CS : AREA32CS	Specify the coordinate system of the user definition area *. 0: Base coordinate system (conventional compatibility) 1: Robot coordinate system
	AREA1P1 : AREA32P1	Designated the 1st point of the area. There are eight elements, set in the order of x, y, z, a, b, c, L1, L2. (L1 and L2 are the additional axes.)
	AREA1P2	Designated the 2nd point of the area. There are eight elements, set in the order of x, y, z, a, b, c, L1, L2.
	AREA32P2	(L1 and L2 are the additional axes.)
	AREA1ME :	Designate which mechanism to use the 32 types of set area. The mechanism No. to use is set with 1 to 3.
	AREA32ME	
	AREA1AT : AREA32AT	Designate the area check type. (Invalid/zone/interference = 0/1/2) Zone: The dedicated output signal USRAREA turns ON. Interference: An error occurs
Automatic return setting	RETPATH	Set to restart the program after returning to the interrupt position when resuming operation after an interruption.
Buzzer ON/OFF	BZR	Designate whether to the turn buzzer ON or OFF.
Jog setting	JOGJSP	Designate the joint jog and step operation speed. (Set dimension H/L amount, max. override.)
	JOGPSP	Designate the linear jog and step operation speed. (Set dimension H/L amount, max. override.)
Jog speed limit value	JOGSPMX	Limit the operation speed during the teaching mode. Max. 250[mm/s]

Parameter		Details
Hand type	HANDTYPE	Set the hand type of the single/double solenoid, and the signal No. (Single/double = S/D) Set the signal No. after the hand type. Example) D900
Stop input B contact designation	INB	Change the dedicated input (stop) between the A contact and B contact.
User-designated origin	USERORG	Designate the user-designated origin position.
Program selection memory	SLOTON	Select the program selected previously when initializing the slot. The non-selected state will be entered when not set.
Communication setting	CBAU232	Set the baud rate.
	CLEN232	Set the character length.
	CPRTY232	Set the parity.
	CSTOP232	Set the stop bit.
	CTERM232	Set the end code.
Slot table	SLT1 : SLT32	Make settings (program name, operation type, order of priority, etc.) for each slot during slot initialization.
No. of multi-tasks	TASKMAX	Designate the No. of programs to be executed simultaneously. (Max. 32)
Select the function of singular point adjacent alarm	MESNGLSW	Designate the valid/invalid of the singular point adjacent alarm. (Invalid/Valid = 0/1) When this parameter is set up "VALID", this warning sound is buzzing even if parameter: BZR (buzzer ON/OFF) is set up "OFF".
Display language.	LNG	Change the language to display on the LCD display of teaching pendant.

5 Instruction Manual

5.1 The details of each instruction manuals

The contents and purposes of the documents enclosed with this product are shown below. Use these documents according to the application.

Instruction manuals enclosed in dashed lines in the list below are for optional products.

For special specifications, a separate instruction manual describing the special section may be enclosed.

Safety Manual

Explains the common precautions and safety measures to be taken for robot handling, system design and manufacture to ensure safety of the operators involved with the robot.

Standard **Specifications** or special **Specifications**

Explains the product's standard specifications, factory-set special specifications, option configuration and maintenance parts, etc. Precautions for safety and technology, when incorporating the robot, are also explained.

Robot Arm Setup & Maintenance Explains the procedures required to operate the robot arm (unpacking, transportation, installation, confirmation of operation), and the maintenance and inspection procedures.

Controller Setup, Basic Operation and Maintenance

Explains the procedures required to operate the controller (unpacking, transportation, installation, confirmation of operation), basic operation from creating the program to automatic operation, and the maintenance and inspection procedures.

Detailed Explanation of Functions and **Operations**

Explains details on the functions and operations such as each function and operation, commands used in the program, connection with the external input/output device, and parameters, etc.

Troubleshooting

Explains the causes and remedies to be taken when an error occurs. Explanations are given for each error No.

Additional axis function

Explains the specifications, functions and operations of the additional axis control.

Tracking Function Manual

Explains the control function and specifications of conveyor tracking

Extended Function Instruction Manual

Explains the detailed description of data configuration of shared memory, monitoring, and operating procedures, about the GOT (CRnD-700 series controller).

6 Safety

6.1 Safety

Measures to be taken regarding safety of the industrial robot are specified in the "Labor Safety and Sanitation Rules". Always follow these rules when using the robot to ensure safety.

6.1.1 Self-diagnosis stop functions

This robot has the self-diagnosis stop functions shown in Table 6-1 and the stop functions shown in Table 6-2 for safe use.

Table 6-1 : Self-diagnosis stop functions

No.	Fur	nction	Details	Remarks				
1	·			The drive circuit is shut off. The robot stops, and an alarm displays.				
2	Overcurrent function	9		The drive circuit is shut off. The robot stops, and an alarm displays.				
3	Encoder disconnection diagnosis function				Activates when the encoder cable is disconnected.	The drive circuit is shut off. The robot stops, and an alarm displays. $ \\$		
4	Deflection over diagnosis function		Activates when an error occurs between the command value and actual position, and the error exceeds the specified amount.	The drive circuit is shut off. The robot stops, and an alarm displays.				
5	AC power voltage drop diagnosis function		Activates when the AC power voltage drops below the specified value.	The drive circuit is shut off. The robot stops, and an alarm displays.				
6	CPU error detection function		Activates when an error occurs in the CPU.	The drive circuit is shut off. The robot stops, and an alarm displays.				
7	Overrun prevention	Software limit detection	This is the limit provided by the software to enable operation only in the operation range.	The drive circuit is shut off. The robot stops, and an alarm displays.				
	function	Mechanical stopper	This is the mechanical stopper provided outside the software.	The robot mechanically stops, and function 1 or 2 activates.				

Table 6-2: List of stop functions

Stop function	Operation panel	Teaching pendant	External input	Details
Emergency stop	0	0	0	This is the stop with the highest degree of emergency. The servo power is shut off, and the mechanical brakes (all axes) activate to stop the robot. To recover, reset the alarm, and turn the servo ON with the servo ON command.
Stop	0	0	0	This is a stop operation with a high degree of emergency. The robot immediately decelerates and stops. Note that the servo power is not shut off. Use this when using the collision evasion sensor, etc.

6.1.2 External input/output signals that can be used for safety protection measures

Table 6-3: External input/output signals that can be used for safety protection measures

	Signal Connection point		Parameter	Functions	Usage method			
	External emer- gency stop	Terminal (EMG IN)	-	This servo power is shut off, and the robot stops immediately.	Externally installed emergency stop switch. Door switch on safety protection fence. Stopping at high-level error occurrence.			
	Door switch	•	-		The door switch of the safe protection fence			
	Enabling device input		-		Enabling device. The safety switch during teaching work			
Input	Stop Parallel I/O unit or interface		STOP	The program execution is stopped, and the robot stops. The servo power is not shut off.	The robot is stopped when a peripheral device fault occurs. The servo power is not shut off.			
	Servo OFF		SRVOFF	The servo power can be shut off.	The robot is stopped when a peripheral device fault occurs. The servo power is not shut off.			
	Automatic oper- ation enable		AUTOENA	Disables automatic operation when inactive.	Door switch on safety protection fence			
	In servo ON Parallel I/O unit or		SRVON	The servo power ON/OFF state is output.	The servo power ON/OFF state is shown and alerted with the display lamps.			
Output	Waiting	interface STOP Outputs t stopped.		Outputs that the robot is temporarily stopped.	The temporary stop state is shown and alerted with the display lamps.			
	In alarm		ERRRESET	Outputs when an alarm occurs in the robot.	The alarm state is shown and alerted with the display lamps.			

[Caution] The external emergency stop input is prepared as a b contact for safety proposes. Thus, if the emergency stop input circuit is opened when the robot is started up, the robot will not operate. Refer to Page 216, "6.1.7 Examples of safety measures" for details.

6.1.3 Precautions for using robot

The safety measures for using the robot are specified in the "Labor Safety and Sanitation Rules". An outline of the rules is given below.

(1) Robot installation

- Secure sufficient work space required to safely perform work such as teaching and maintenance related to the robot.
- Install the controller outside the robot's motion space. (If a safety fence is provided, install outside the fence.)
- Install the controller where the entire robot operation can be viewed.
- Install display lamps, etc., to indicate the robot's operation state.
- Securely fix the robot arm onto the fixing table with the designated bolts.

(2) Prevention of contact with operator

- Install a safety fence or enclosure so that the operator cannot easily enter the robot's motion space.
- Install an interlock function that will stop the robot if the safety fence or enclosure door is opened.

(3) Work procedures

- Create and observe work procedures for the robot teaching, operation, inspection and emergencies.
- Create hand signals to be followed when several operators are working together.
- Create displays such as "Teaching in Progress" and "Inspection in Progress" to be put up when an operator is in the robot's motion space so that other operators will not operate the operation panel (controller, control panel).

(4) Training

- Train the operators about the operations, maintenance and safety required for the robot work.
- Only trained and registered operators must operate the robot.
 Participation in the "Special training for industrial robots" sponsored by the Labor Safety and Sanitation Committee, etc., is recommended for safety training.

(5) Daily inspection and periodic inspection

- · Iways inspect the robot before starting daily operations and confirm that there are no abnormalities.
- Set the periodic inspection standards in view of the robot's ambient environment and operation frequency, and perform periodic inspections.
- Make records when periodic inspections and repairs have been done, and store the records for three or more years.

6.1.4 Safety measures for automatic operation

- (1) Install safety fences so that operators will not enter the operation area during operation and indicate that automatic operation is in progress with lamps, etc.
- (2) Create signals to be given when starting operation, assign a person to give the signal, and make sure that the operator follows the signals.

6.1.5 Safety measures for teaching

Observe the following measures when teaching, etc., in the robot's operation range.

- (1) Specify and follow items such as procedures related to teaching work, etc.
- (2) Take measures so that operation can be stopped immediately in case of trouble, and measures so that operation can be restarted.
- (3) Take measures with the robot start switch, etc., to indicate that teaching work is being done.
- (4) Always inspect that stop functions such as the emergency stop device before starting the work.
- (5) Immediately stop the work when trouble occurs, and correct the trouble.
- (6) Take measures so that the work supervisor can immediately stop the robot operation when trouble occurs.
- (7) The teaching operator must have completed special training regarding safety. (Training regarding industrial robots and work methods, etc.)
- (8) Create signals to be used when several operators are working together.

6.1.6 Safety measures for maintenance and inspections, etc.

Turn the power OFF and take measures to prevent operators other than the relevant operator from pressing the start switch when performing inspections, repairs, adjustments, cleaning or oiling.

If operation is required, take measures to prevent hazards caused by unintentional or mistaken operations.

- (1) Specify and follow items such as procedures related to maintenance work, etc.
- (2) Take measures so that operation can be stopped immediately in case of trouble, and measures so that operation can be restarted.
- (3) Take measures with the robot start switch, etc., to indicate that work is being done.
- (4) Take measures so that the work supervisor can immediately stop the robot operation when trouble occurs.
- (5) The operator must have completed special training regarding safety. (Training regarding industrial robots and work methods, etc.)
- (6) Create signals to be used when several operators are working together.

6.1.7 Examples of safety measures

Two emergency-stop input circuits are prepared on the user wiring terminal block of the controller. Create a circuit as shown below for safety measures. In addition, the figure shows the normal state which is not in the emergency stop state.

[Caution] Since we have omitted the information in part because of explanation, there is the section different from the product. Also refer to Page 220, "(1) External emergency stop connection [supplementary explanation]" and Page 147, "3.6.1 Connection of the external emergency stop".

[Note] In the emergency-stop related wiring by the customer, if the coil (is not the contact points) of the relay prepared by the customer is connected to the controller, please be sure to implement the measure against the noise by the customer in the coil section. And, please also take the lifetime of noise suppression parts into consideration.

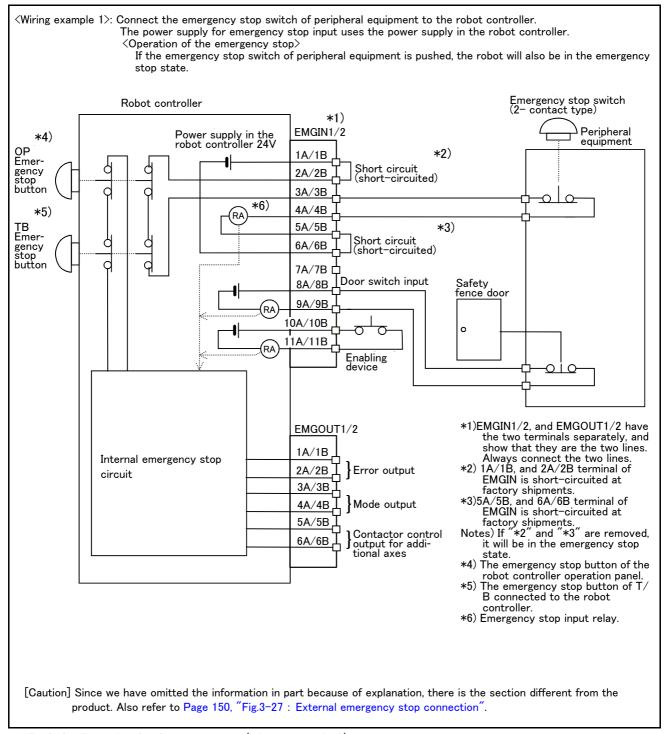


Fig.6-1: Example of safety measures (Wiring example 1)

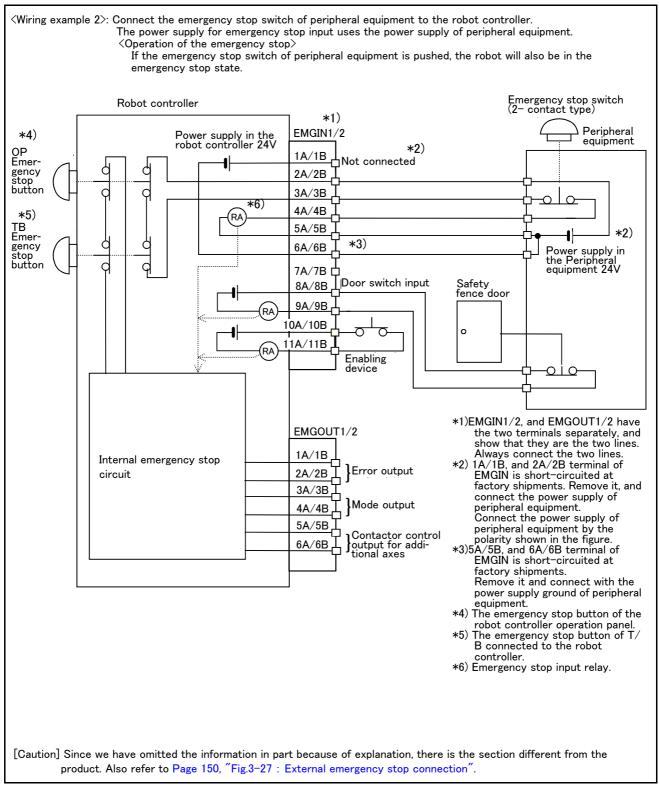


Fig.6-2: Example of safety measures (Wiring example 2)

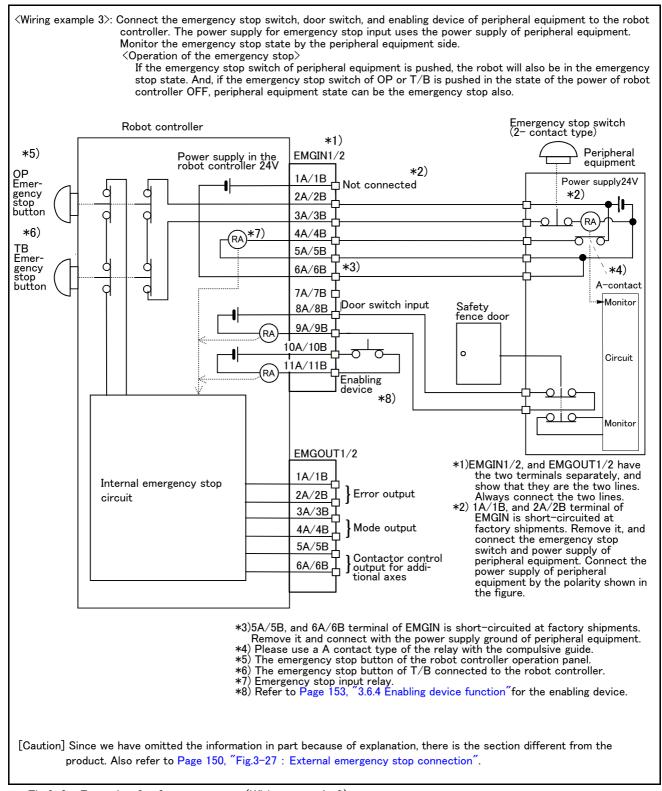


Fig.6-3: Example of safety measures (Wiring example 3)

(Wiring example 4): Connect the emergency stop switch of peripheral equipment, and the door switch to two robot controllers, and it interlocks. Connect the enabling device to the robot controller. The power supply for emergency stop input uses the power supply of peripheral equipment. Monitor the emergency stop state by the peripheral equipment side. Operation of the emergency stop> If the emergency stop switch of peripheral equipment is pushed, the robot will also be in the emergency stop state. And, if the emergency stop switch of OP or T/B is pushed in the state of the power of robot controller OFF, peripheral equipment state can be the emergency stop also. Emergency stop switch (4- contact type) *1) Peripheral equipment Robot controller #1 *1) *2) *5) FMGIN1/2 *2) Power supply24V 1A/1B -1 Not connected Emer 2A/2B gency stop 3A/3B Circuit -(RA button *7)_(RA) 4A/4B *6) 5A/5B ΤB 6A/6B 【***3**) Emer-gency stop 7A/7B Door switch input button *4) Monitor 9A/9B DA/10B -0 1A/11B *8) EMGOUT1/2 Internal emergency 1A/1B stop circuit Safety fence doo 2A/2B | Error output 3A/3B 5A/5B Monitor مزما 6A/6B] Robot controller #1 *5) OP Emer-gency stop Power supply in the robot controller 24V EMGIN1/2 *2) 1A/1B 4 Not connected 2A/2B 3A/3B (RA) button *7)_(RA) 4A/4B *6) 5A/5B TB 6A/6B (*3) Emer-Monitor 7A/7B Door switch input *4) button 010 9A/9B (RA) 11A/11B Enabling device 10A/10B (RA) *1)EMGIN1/2, and EMGOUT1/2 have the two terminals separately, and show that they are the two lines. Always connect the two lines *8) If necessary to stop two robots simultaneously by one emergency stop switch please use the 4 contact type emergency stop switch. EMGOUT1/2 *2) 1A/1B, and 2A/2B terminal of EMGIN is short-circuited at factory Internal emergency 1A/1B shipments. Remove it, and connect the emergency stop switch 2A/2B] Error output stop circuit and power supply of peripheral equipment. Connect the power 3A/3B supply of peripheral equipment by the polarity shown in the figure. *3)5A/5B, and 6A/6B terminal of EMGIN is short-circuited at factory 5A/5B GA/6B Contactor control output for additional axes shipments. Remove it and connect with the power supply ground of peripheral equipment. Notes) Please use 5A/5B and 6A/6B terminal, connected. *4) Please use a A contact type of the relay with the compulsive *5) The emergency stop button of the robot controller operation panel. *6) The emergency stop button of T/B connected to the robot controller. *7) Emergency stop input relay. *8) Refer to Page 153, "3.6.4 Enabling device function" for the enabling device. [Caution] Since we have omitted the information in part because of explanation, there is the section different from the product. Also refer to Page 150, "Fig.3-27: External emergency stop connection".

Fig.6-4: Example of safety measures (Wiring example 4)

- (1) External emergency stop connection [supplementary explanation]
 - (1) Use a 2-contact type switch for all switches.
 - (2) Install a limit switch on the safety fence's door. With a constantly open contact (a contact), wire to the door switch input terminal so that the switch turns ON (is conducted) when the door is closed, and turns OFF (is opened) when the door is open.
 - (3) Use a manual-return type 2b-contact for the emergency stop button.
 - (4) Classify the faults into minor faults (faults that are easily restored and that do not have a great effect) and major faults (faults that cause the entire system to stop immediately, and that require care in restoration), and wire accordingly.

[Caution] The emergency stop input (terminal block) on the user wiring in the controller can be used for safety measures as shown in Fig. 6-1 to Fig. 6-4. Note that there are limits to the No. of switch contacts, capacity and cable length, so refer to the following and install.

• Switch contactPrepare a 2-contact type.*1)

· Switch contact capacity...........Use a contact that operates with a switch contact capacity of approx. 1mA to 100mA/24V. *1)

If you connect the relay etc., rated current of the coil should use the

relay which is 100mA/24V or less. (Refer to Fig. 6-5) Cable length...... .The length of the wire between the switch and terminal block must

be max. 15m or less. Please use the shield line, in case of the cable may receive the noise etc. by other equipment, such as servo amplifier. And, since the ferrite core is attached as noise measures parts, please utilize.

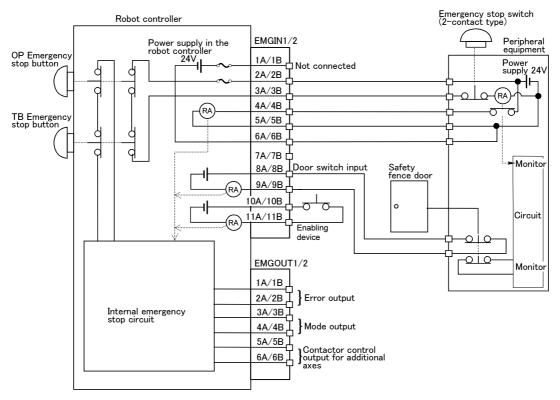


Fig.6-5: Limitations when connecting the relay etc.



 $extstyle oxed{I} oxed{CAUTION}$ You should always connect doubly connection of the emergency stop, the door switch, and the enabling switch. (Connect with both of side-A and side-B of the controller rear connector) In connection of only one side, if the relay of customer use should break down, it may not function correctly.



Be sufficiently careful and wiring so that two or more emergency stop switches work independently. Don't function only on AND conditions (Two or more emergency stop switch status are all ON).

^{*1)} The minimum load electric current of the switch is more than 5mA/24V.

6.2 Working environment

Avoid installation in the following places as the equipment's life and operation will be affected by the ambient environment conditions. When using in the following conditions, the customer must pay special attention to the preventive measures.

(1) Power supply

- · Where the voltage fluctuation will exceed the input voltage range.
- Where a momentary power failure exceeding 20ms may occur.
- Where the power capacity cannot be sufficiently secured.



Please use the controller with an input power supply voltage fluctuation rate of 10% or less. In the case of 200 VAC input, for example, if the controller is used with 180 VAC during the day and 220 VAC during the night, turn the servo off once and then on again. If this is not performed, an excessive regeneration error may occur.

(2) Noise

• Where a surge voltage exceeding 1000V, 1 μ s may be applied on the primary voltage. Near large inverters, high output frequency oscillator, large contactors and welding machines. Static noise may enter the lines when this product is used near radios or televisions. Keep the robot away from these items.

(3) Temperature and humidity

- Where the atmospheric temperature exceeds 40 degree, lower than 0 degree.
- Where the relative humidity exceeds 85%, lower than 45%, and where dew may condense.
- · Where the robot will be subject to direct sunlight or near heat generating sources such as heaters.

(4) Vibration

• Where excessive vibration or impact may be applied. (Use in an environment of 34m/s^2 or less during transportation and 5m/s^2 or less during operation.)

(5) Installation environment

- · Where strong electric fields or magnetic fields are generated.
- Where the installation surface is rough. (Avoid installing the robot on a bumpy or inclined floor.)
- · Where there is heavy powder dust and oil mist present.

6.3 Precautions for handling

- (1) The RH-6SDH/12SDH series has brakes on J3 axis. The RH-18SDH/20SDH series has brakes on J3 axis and J4 axes. The precision of the robot may drop, looseness may occur and the reduction gears may be damaged if the robot is moved with force with the brakes applied.
- (2) Avoid moving the robot arm by hand. When unavoidable, gradually move the arm. If moved suddenly, the accuracy may drop due to an excessive backlash, or the backed up data may be destroyed.
- (3) Note that depending on the posture, even when within the movement range, the shaft section could interfere with the base section. Take care to prevent interference during jog. *1)
- (4) The robot arm is configured of precision parts such as bearings. Grease is used for lubricating these parts. When cold starting at low temperatures or starting operation after long-term stoppage, the position accuracy may drop or servo alarms may occur. If these problems occur, perform a 5 to 10 minute running-in operation at a low speed (about a half of normal operating speed).
- (5) RH-3SDHR series robot shaft (J3 axis) is made into the structure which can let the optional hand tube and hand input cable pass through. The grease is applied to the contact sections of inside of the shaft, and the piping fixing bracket because to reduce these frictions. Although this grease and worn-out dust may stain at end of the shaft during robot movement, it does not have effect on robot movement. Please wipe off the grease if necessity.
- (6) The robot arm and controller must be grounded with Class D grounding to secure the noise resistance and to prevent electric shocks.
- (7) The items described in these specifications are conditions for carrying out the periodic maintenance and inspections described in the instruction manual.

^{*1)} Jog operation refers to operating the robot manually using the teaching pendant.

- (8) When using the robot arm on a mobile axis or elevating table, the machine cables enclosed as standard configuration may break due to the fixed installation specifications. In this case, use the machine cable extension (for flexed)" factory shipment special specifications or options.
- (9) If this robot interferes with the workpiece or peripheral devices during operation, the position may deviate, etc. Take care to prevent interference with the workpiece or peripheral devices during operation.
- (10) Do not attach a tape or a label to the robot arm and the controller. If a tape or a label with strong adhesive power, such as a packaging tape, is attached to the coated surfaces of the robot arm and controller, the coated surface may be damaged when such tape or label is peeled off.
- (11) If the robot is operated with a heavy load and at a high speed, the surface of the robot arm gets very hot. It would not result in burns, however, it may cause secondary accidents if touched carelessly.
- (12) Do not shut down the input power supply to stop the robot. If the power supply is frequently shut down during a heavy load or high-speed operation, the speed reducer may be damaged, backlash may occur, and the program data may be destroyed.
- (13) During the robot's automatic operation, a break is applied to the robot arm when the input power supply is shut down by a power failure, for instance. When a break is applied, the arm may deviate from the operation path predetermined by automatic operation and, as a result, it may interfere with the mechanical stopper depending on the operation at shutdown. In such a case, take an appropriate measure in advance to prevent any dangerous situation from occurring due to the interference between the arm and peripheral devices.

 Example) Installing a UPS (uninterruptible power supply unit) to the primary power source in order to reduce interference.
- (14) Do not conduct an insulated voltage test. If conducted by mistake, it may result in a breakdown.
- (15) Fretting may occur on the axis which moving angle or moving distance move minutely, or not moves. Fretting is that the required oil film becomes hard to be formed if the moving angle is small, and wear occurs. The axis which not moved is moving slightly by vibration etc. To make no fretting recommends to move these axes about once every day the 30 degree or more, or the 30mm or more.
- (16) The United Nations' Recommendations on the Transport of Dangerous Goods must be observed for transborder transportation of lithium batteries by air, sea, and land. The lithium batteries (Q6BAT,A6BAT) used in
 Mitsubishi industrial robots contain less than 1 g of lithium and are not classified as dangerous goods. However,
 if the quantity of lithium batteries exceeds 24 batteries for storage, etc., they will be classified as Class 9: Miscellaneous dangerous substances and articles. Shipping less than 24 batteries is recommended to avoid having
 to carry out transport safety measures as the customer's consignor. Note that some transportation companies may request an indication that the batteries are not dangerous goods be included on the invoice. For shipping requirement details, please contact your transportation company.
- (17) If the air supply temperature (primary piping) used for the tool etc. is lower than ambient air temperature, the dew condensation may occur on the coupling or the hose surface.
- (18) Collision detection function is valid condition for both of automatic and jog operation at shipping.

 So, the robot stops immediately if the robot's tool or arm interferes with a peripheral device, minimizing damage. Therefore, please use in the valid condition.



To the users of the RH-A series

The coordinate system of axis J3 of the RH-SD series has been changed from the conventional RH-A series.*1) For this reason, axis J3 may move to a wrong position if a conventional program is executed when an RH-A series robot is replaced by an RH-SD series robot. Please be sure to check the robot operation position via step operation and teach the robot again if the position is wrong.

^{*1)} In the conventional RH-A series, there was a gap between the XYZ coordinate value and JOINT coordinate value of axis J3, which is eliminated in the RH-S series.

RH-5AH series......When the XYZ coordinate value is 0mm, the JOINT coordinate value is 97mm RH-10AH/15AH series...When the XYZ coordinate value is 0mm, the JOINT coordinate value is -10mm RH-SDH series.....JOINT coordinate value = XYZ coordinate value

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	length		350 □ 45		□ 550		50		□ 85	0		850	□ 1000
Strok	Ке	□ 200 □ 320		□ 170 □ 270	□ 350 □ 450	□ 300 □ 380		■ 350		■ 300	□ 350 □ 450		□ 300 □ 380
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Note1	C: Clean, M: Oil	mist、SM:	Protection	specification c	ontroller								
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Robo	t arm Machine	cable	□ 5m	fixed type		□ 2	m fixe	d type: 18	S-02U0	CBL-03(RH6S	DH series))/	
	/7 . !! !		<u> </u>	.\				15	S-02U0	CBL-01(RH-1	2SDH/18S	DH/20	OSDH series)
Jptio	ons (Installab Ite		hipmer				Dro	violen en	d one	cifications	whon nro	vidad	ı
	Machine cable			Ty _I 1S− □□ CE		RH-6SDH				provided 5			
	Macrimo dabio			1S- 🗆 🗆 LO		RH-6SDH				provided 5			
				1S- 🗆 🗆 CE	3L-01	RH-12SDH/							0m □ 15m
				1S- □□ LCBL-01		RH-12SDH/18SDH/20SDH Bending : ☐ Not provided ☐ 5m ☐ 10m ☐ 15m							
_	Solenoid valve	set		1S-VD04M-04		RH-6SDH: Not provided Provided							
arn				1S-VD04ME-04		RH-6SDH: Not provided Provided							
Robot arm				1S-VD04M-03 1S-VD04ME-03		RH-12SDH				Not provided			
ŭ	Hand input cal	ale.		1S-VD04ME		RH-12SDH				Not provide	d ∐ Provi	ded	
	Hand output c			1S-GR35S-02		□ Not provided □ Provided □ Not provided □ Provided							
	Hand curl tube			1E-ST0408C-300		RH-6SDH:							
		1N-ST0608C			С	RH-12SDH/18SDH/20SDH85** : ☐ Not provided ☐ Provided							
				1N-ST0608C-01		RH-20SDH100** : ☐ Not provided ☐ Provided							vided
	Teaching pendan	t		R32TB- □□		□ Not provided □ 7m □ 15m							
				R56TB- 🗆 🗆		□ Not provided □ 7m □ 15m							
e	Pneumatic han Parallel I/O int					□ Not provided □ 2A-RZ365(Sink) □ 2A-RZ375(Source) □ Not provided 2D-TZ368(Sink) □ -1pc. □ -2pc. □ -3pc.							
Controller				2D-TZ368/2	2D-TZ378	D-TZ378(Source) □ -1pc. □ -2pc. □ -3pc. 2D-TZ378(Source) □ -1pc. □ -2pc. □ -3pc.							
ဝိ	External I/O ca	able		2D−CBL □ [(For 2D−TZ36	□ Not provided □ 5m-()pc. □ 15m-1()pc.								
	Parallel I/O un	it		2A-RZ361/2A-RZ371		☐ Not provided Sink type: 2A-RZ361 ()unit Source type: 2A-RZ371 ()unit							
	External I/O ca	able		2A−CBL □ [(For 2A−RZ36		□ Not provided □ 5m-()pc. □ 15m-1()pc.							
	CC-Link interf	ace		2D-TZ576		☐ Not provided ☐ Provided							
	Expansion men	nory		2D-TZ454		□ Not provided □ Provided							
	Controller prot	ection box		CR1D-MB		☐ Not provided ☐ Provided							
	RT ToolBox2 RT ToolBox2 mir			3D-11C-WIN		□ Not provided □ Windows2000/XP/Vista English CD-ROM □ Not provided □ Windows2000/XP/Vista English CD-ROM							
	Personal comp			3D-12C-WIN 2D-232CBL0		□ Not pro				/ AF/ VISTA E	ngusti CD	NOM	ı
	Instructions ma			5S-DD00-PI		□ Not pro) set			
	1			l									

☐ Material handling ☐ Assembly ☐ Machining L/UL ☐ Sealing ☐ Testing and inspection ☐ Other (

Atmosphere \Box General environment \Box Clean \Box Dust provided \Box Other(

Hand mass (

) g

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Work description
Workpiece mass (

Remarks

Customer information Company name				Name		
Address				Telephone		
<u> </u>			`	· Glophono		
urch	nased mode (H	anging inst	allation specificatio	n)		
	Item				Specification	
oad				1	■ 3kg	
	onment		☐ General		☐ Clean	☐ Waterproof
	ength		= 450	1	■ 350	
Strok		DU	■ 150		DIL ACDUDATION	■ 120
	t type name		-3SDHR3515	│ .	RH-3SDHR3512C	RH-3SDHR3512W
hipp		ecifications			nly at time of shipme	
	Item		Standard specifica	ations		ecial shipping specifications
	t arm Machine ca		5m fixed type		☐ 2m fixed type: 1S	G-02UCBL-01(RH-3SDHR series)
ptio	ns (Installable	after shipn	nent)			
	Item		Туре			nd specifications when provided.
	Operating range	change	1S-DH-05J1		□ Not provided □ Provided	
			1S-DH-05J2		☐ Not provided ☐ Provided	
	Machine cable ex	tension	1S- 🗆 CBL-01		Fixing: ☐ Not provided ☐ 5m ☐ 10m ☐ 15m	
٤			1S- 🗆 LCBL-01		Bending: Not provide	
Robot arm	Solenoid valve se	et	1S-VD04-05 (Sink)		Standard/Clean specification: ☐ Not provided ☐ 1S-VD04-05	
poq			1S-VD04E-05(Sour		M . C 'C' .'	☐ 1S-VD04E-05
R			1S-VD04W-05 (Sin			☐ Not provided ☐ 1S-VD04W-05 ☐ 1S-VD04WE-05
	Hand inner askla		1S-HC00S-01	· · · · =		
	Hand input cable		1S-GR35S-02	·		
1	Hand output cable Hand tube		15 GR033 02	·		
	Teaching pendant			R32TB-		
	D 1 (
er	Pneumatic hand interface Parallel I/O interface ^{Note1)}		2A-RZ365/2A-RZ3	3/3	□ Not provided □ 2A-RZ365(Sink) □ 2A-RZ375(Source) □ Not provided 2D-TZ368(Sink) □ -1pc. □ -2pc. □ -3	
Controller			2D-TZ368/2D-TZ3		2D-TZ	2378(Source) □ -1pc. □ -2pc. □ -3pc.
ŏ	External I/O cable		2D−CBL □□ (For 2D−TZ368/TZ378		□ Not provided □ 5m-()pc. □ 15m-1()pc.
	Parallel I/O unit		2A-RZ361/2A-RZ3	371	☐ Not provided Sink ty Source	/pe: 2A-RZ361 ()unit e type: 2A-RZ371 ()unit
	External I/O cable		2A-CBL		□ Not provided □ 5m-()pc. □ 15m-1()pc.
	CC-Link interface	Э	2D-TZ576		☐ Not provided ☐ Provid	ded
	Expansion memor		2D-TZ454		☐ Not provided ☐ Provided	ded
	RT ToolBox2		3D-11C-WINE		□ Not provided □ Windows2000/XP/Vista Englishi CD-ROM	
	RT ToolBox2 mini		3D-12C-WINE		□ Not provided □ Windows2000/XP/Vista Englishi CD-ROM	
	Personal compute	er cable	2D-232CBL03M		□ Not provided □ Provided	
	Instructions manu	ıal	5S-D00-PE01		□ Not provided □ Provided () set	
	l) One parallel I/			ed at fa	actory shipping for "-S	12" and "-S312" specification only.
	ntenance parts		•	ss. 🗆 E	Backup batteries Q6BAT	() pcs.
oho	t selection che	ck list				
			ring □ Assembly □ Ma	achinin~	I/II Sealing Tab	ting and inspection
	piece mass (t

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EC-Statement of Compliance

No. E6 12 07 25554 044

Holder of Certificate: Mitsubishi Electric Corporation

Tokyo BILD., 2-7-3 Marunouchi,

Chiyoda-ku

Tokyo

100-8310 JAPAN

Name of Object: Industrial, Scientific and Medical

equipment

Industrial Robot

Model(s): SD series

(See Attachment for Nomenclature)

Description of

Object:

Rated Voltage:

230 VAC(1 phase)/ 230, 400 VAC(3 phase)

Rated Power:

0.6 kW (230 VAC)/ 1.7 kW (230 VAC)/

3.4 kW (230, 400 VAC)

Protection Class:

Tested

EN 61000-6-4:2007 EN 61000-6-2:2005

according to: EN 61000-6-2:2005

This EC-Statement of Compliance is issued according to the Directive 2004/108/EC relating to electromagnetic compatibility. It confirms that the listed apparatus complies with such aspects of the essential requirements of the EMC directive as specified by the manufacturer or his authorized representative in the European Community and applies only to the sample and its technical documentation submitted to TÜV SÜD Product Service GmbH for testing and certification. See also notes overleaf

Technical report no.:

73538182



Date, 2012-07-18

(Johann Roidt)

TÜV SÜD Product Service GmbH is Notified Body to the Directive 2004/108/EC of the European Parliament and of the council with the identification number 0123.

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SD series Grouping Items

1	AC 400V /230V	3 phase 3.4kW
	/ (C TOO V / COO V	O priaco ot inti

1.	RV-12SD(-S*	*)
----	-------------	----

- 2. RV-12SDL(-S**)
- 3. RV-12SDC(-S**)
- 4. RV-12SDLC(-S**)
- 5. RV-12SD-SUL**
- 6. RV-12SDL-SUL**
- 7. RV-12SDC-SUL**
- 8. RV-12SDLC-SUL**
- 9. RV-18SD(-S**)
- 10. RV-18SDC(-S**)
- 11. RV-18SD-SUL**
- 12. RV-18SDC-SUL**
- 13. RV-6SD-SM6**
- 14. RV-6SDL-SM6**
- 15. RV-6SD-SULM6**
- 16. RV-6SDL-SULM6**
- 17. RV-3SD-SM6**
- 18. RV-3SDB-SM6**
- 19. RV-3SDB-SULM6**
- 20. RV-3SDJ-SM6**
- 21. RV-3SDJB-SM6**
- 22. RV-3SDJB-SULM6**
- 23. RH-6SDH4517M-SM6**
- 24. RH-6SDH3517M-SM6**
- 25. RH-6SDH5517M-SM6**
- 26. RH-6SDH4517M-SULM6**
- 27. RH-6SDH3517M-SULM6**
- 28. RH-6SDH5517M-SULM6**
- 29. RH-12SDH7030M-SM6**
- 30. RH-12SDH5530M-SM6**
- 31. RH-12SDH8530M-SM6**
- 32. RH-18SDH8530M-SM6**

- 33. RH-12SDH7030M-SULM6**
- 34. RH-12SDH5530M-SULM6**
- 35. RH-12SDH8530M-SULM6**
- 36. RH-18SDH8530M-SULM6**
- 37. RH-6SDH4527M-SM6**
- 38. RH-6SDH3527M-SM6**
- 39. RH-6SDH5527M-SM6**
- 40. RH-6SDH4527M-SULM6**
- 41. RH-6SDH3527M-SULM6**
- 42. RH-6SDH5527M-SULM6**
- 43. RH-12SDH7038M-SM6**
- 44. RH-12SDH5538M-SM6**
- 45. RH-12SDH8538M-SM6**
- 46. RH-12SDH7038M-SULM6**
- 47. RH-12SDH5538M-SULM6**
- 48. RH-12SDH8538M-SULM6**
- 49. RH-20SDH8538M-SM6**
- 50. RH-20SDH8530M-SM6**
- 51. RH-20SDH10038M-SM6**
- 52. RH-20SDH10030M-SM6**
- 53. RH-20SDH8538M-SULM6**
- 54. RH-20SDH8530M-SULM6**
- 55. RH-20SDH10038M-SULM6**
- 56. RH-20SDH10030M-SULM6**
- 57. RH-3SDHR3512MW-SM6**
- 58. RH-3SDHR5512MW-SM6**
- 59. RH-3SDHR3512MW-SULM6**
- 60. RH-3SDHR5512MW-SULM6**
- 61. RH-3SDHR3512M-SM6**
- 62. RH-3SDHR5512M-SM6**
- 63. RH-3SDHR3512M-SULM6**
- 64. RH-3SDHR5512M-SULM6**

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- 65. RH-3SDHR3512W-SM6**
- 66. RH-3SDHR5512W-SM6**
- 67. RH-3SDHR3512W-SULM6**
- 68. RH-3SDHR5512W-SULM6**

AC 230V 1 phase 1.7kW

- RV-6SD(-S**)
- 2. RV-6SDL(-S**)
- RV-6SDC(-S**) 3.
- RV-6SDLC(-S**) 4.
- RV-6SD-SUL** 5.
- RV-6SDL-SUL**
- 7. RV-6SDC-SUL**
- RV-6SDLC-SUL** 8.
- RV-3SD-S3** 9.
- 10. RV-3SDC-S3**
- 11. RV-3SDB-S3**
- 12. RV-3SDBC-S3**
- 13. RV-3SDB-SUL3**
- 14. RV-3SDBC-SUL3**
- 15. RV-3SDJ-S3**
- 16. RV-3SDJC-S3**
- 17. RV-3SDJB-S3**
- 18. RV-3SDJBC-S3**
- 19. RV-3SDJB-SUL3**
- 20. RV-3SDJBC-SUL3**
- 21. RH-6SDH4520-S3**
- 22. RH-6SDH3520-S3**
- 23. RH-6SDH5520-S3**
- 24. RH-6SDH4517M-S3**
- 25. RH-6SDH3517M-S3**
- 26. RH-6SDH5517M-S3**
- 27. RH-6SDH4517C-S3**
- 28. RH-6SDH3517C-S3**
- 29. RH-6SDH5517C-S3**
- 30. RH-6SDH4520-SUL3**

- 31. RH-6SDH3520-SUL3**
- 32. RH-6SDH5520-SUL3**
- 33. RH-6SDH4517M-SUL3**
- 34. RH-6SDH3517M-SUL3**
- 35. RH-6SDH5517M-SUL3**
- 36. RH-6SDH4517C-SUL3**
- 37. RH-6SDH3517C-SUL3**
- 38. RH-6SDH5517C-SUL3**
- 39. RH-12SDH7035(-S**)
- 40. RH-12SDH5535(-S**)
- 41. RH-12SDH8535(-S**)
- 42. RH-18SDH8535(-S**)
- 43. RH-12SDH7030M(-S**)
- 44. RH-12SDH5530M(-S**)
- 45. RH-12SDH8530M(-S**)
- 46. RH-18SDH8530M(-S**)
- 47. RH-12SDH7030C(-S**)
- 48. RH-12SDH5530C(-S**)
- 49. RH-12SDH8530C(-S**)
- 50. RH-18SDH8530C(-S**)
- 51. RH-12SDH7035-SUL**
- 52. RH-12SDH5535-SUL**
- 53. RH-12SDH8535-SUL**
- 54. RH-18SDH8535-SUL**
- 55. RH-12SDH7030M-SUL**
- 56. RH-12SDH5530M-SUL**
- 57. RH-12SDH8530M-SUL**
- 58. RH-18SDH8530M-SUL**
- 59. RH-12SDH7030C-SUL**
- 60. RH-12SDH5530C-SUL**

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LV	(A O) EOOO I O I .	
61. F	RH-12SDH8530C-SUL**	97. RH-20SDH10045(-S**)
62. F	RH-18SDH8530C-SUL**	98. RH-20SDH10035(-S**)
63. F	RV-12SD-S3**	99. RH-6SDH4532-S3**
64. F	RV-12SDL-S3**	100.RH-6SDH3532-S3**
65. F	RV-12SDC-S3**	101.RH-6SDH5532-S3**
66. F	RV-12SDLC-S3**	102.RH-6SDH4527M-S3**
67. F	RV-12SD-SUL3**	103.RH-6SDH3527M-S3**
68. F	RV-12SDL-SUL3**	104.RH-6SDH5527M-S3**
69. F	RV-12SDC-SUL3**	105.RH-6SDH4527C-S3**
70. F	RV-12SDLC-SUL3**	106.RH-6SDH3527C-S3**
71. F	RH-20SDH8538M(-S**)	107.RH-6SDH5527C-S3**
72. F	RH-20SDH8530M(-S**)	108.RH-6SDH4532-SUL3**
73. F	RH-20SDH10038M(-S**)	109.RH-6SDH3532-SUL3**
74. F	RH-20SDH10030M(-S**)	110.RH-6SDH5532-SUL3**
75. F	RH-20SDH8538C(-S**)	111.RH-6SDH4527M-SUL3**
76. F	RH-20SDH8530C(-S**)	112.RH-6SDH3527M-SUL3**
77. F	RH-20SDH10038C(-S**)	113.RH-6SDH5527M-SUL3**
78. F	RH-20SDH10030C(-S**)	114.RH-6SDH4527C-SUL3**
79. F	RH-20SDH8545 –SUL**	115.RH-6SDH3527C-SUL3**
80. F	RH-20SDH8535-SUL**	116.RH-6SDH5527C-SUL3**
81. F	RH-20SDH10045-SUL**	117.RH-12SDH7045(-S**)
82. F	RH-20SDH10035-SUL**	118.RH-12SDH5545(-S**)
83. F	RH-20SDH8538M-SUL**	119.RH-12SDH8545(-S**)
84. F	RH-20SDH8530M-SUL**	120.RH-12SDH7038M(-S**)
85. l	RH-20SDH10038M-SUL**	121.RH-12SDH5538M(-S**)
86. f	RH-20SDH10030M-SUL**	122.RH-12SDH8538M(-S**)
87. F	RH-20SDH8538C-SUL**	123.RH-12SDH7038C(-S**)
88. I	RH-20SDH8530C-SUL**	124.RH-12SDH5538C(-S**)
89. I	RH-20SDH10038C-SUL**	125.RH-12SDH8538C(-S**)
90. l	RH-20SDH10030C-SUL**	126.RH-12SDH7045-SUL**
91. I	RH-12SDH8538M-SUL**	127.RH-12SDH5545-SUL**
92. I	RH-12SDH7038C-SUL**	128.RH-12SDH8545-SUL**
93. I	RH-12SDH5538C-SUL**	129.RH-12SDH7038M-SUL**
94. 1	RH-12SDH8538C-SUL**	130.RH-12SDH5538M-SUL*
95. I	RH-20SDH8545 (-S**)	131.RH-3SDHR3515W(-S**)

96. RH-20SDH8535(-S**)

132.RH-3SDHR5515W(-S**)

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133.RH-3SDHR3512MW(-S**)
134.RH-3SDHR5512MW(-S**)
135.RH-3SDHR3515W-SUL**
136.RH-3SDHR5515W-SUL**
137.RH-3SDHR3512MW-SUL*
138.RH-3SDHR5512MW-SUL*
139.RH-3SDHR3515 (-S**)
140.RH-3SDHR5515 (-S**)
141.RH-3SDHR3512M (-S**)
142.RH-3SDHR5512M(-S**)
143.RH-3SDHR3515-SUL**

144.RH-3SDHR5515-SUL**
145.RH-3SDHR3512M-SUL**
146.RH-3SDHR5512M-SUL**
147.RH-3SDHR3512W (-S**)
148.RH-3SDHR5512W (-S**)
149.RH-3SDHR3512C (-S**)
150.RH-3SDHR5512C(-S**)
151.RH-3SDHR3512W-SUL**
152.RH-3SDHR5512W-SUL**
153.RH-3SDHR3512C-SUL**
154.RH-3SDHR5512C-SUL**

3. AC 230V 1 phase 0.6kW

- 1. RV-2SD(-S**)
- 2. RV-2SDB(-S**)
- 3. RV-2SD-S12
- 4. RV-2SDB-S12
- 5. RV-3SD-S**
- 6. RV-3SDC-S**
- 7. RV-3SDB-S**
- 8. RV-3SDBC-S**
- 9. RV-3SDJ-S**
- 10. RV-3SDJC-S**
- 11. RV-3SDJB-S**
- 12. RV-3SDJBC-S**
- 13. RH-6SDH4520-S**
- 14. RH-6SDH3520-S**
- 15. RH-6SDH5520-S**
- 16. RH-6SDH4517M-S**
- 17. RH-6SDH3517M-S**
- 18. RH-6SDH5517M-S**
- 19. RH-6SDH4517C-S**
- 20. RH-6SDH3517C-S**21. RH-6SDH5517C-S**
- 22. RH-6SDH4532(-S**)

- 23. RH-6SDH3532(-S**)
- 24. RH-6SDH5532(-S**)
- 25. RH-6SDH4527M(-S**)
- 26. RH-6SDH3527M(-S**)
- 27. RH-6SDH5527M(-S**)
- 28. RH-6SDH4527C(-S**)
- 29. RH-6SDH3527C(-S**)
- 30. RH-6SDH5527C(-S**)
- 31. RH-3SDHR3515N(-S**)
- 32. RH-3SDHR5515N(-S**)
- 33. RP-1ADH (-S**)
- 34. RP-3ADH (-S**)
- 35. RP-5ADH (-S**)
- 36. RP-1ADHC(-S**)
- 37. RP-3ADHC (-S**)
- 38. RP-5ADHC (-S**)
- 39. RP-1ADHW (-S**)
- 40. RP-3ADHW (-S**)
- 41. RP-5ADHW (-S**)
- 42. RP-1ADHL (-S**)
- 43. RP-1ADHLC (-S**)
- 44. RP-1ADHLW (-S**)

RTIFIKAT 🔷 CERTIFICATE

Attachment

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Nomenclature

Group A, B Model name description is shown as follows.

R <u>V - x SD x - x</u>

(1) (2) (3) (4) (5)

(1) V: Vertical Robot

(2) Maximum Payload specification:

6 : 6kg 12 : 12kg 18 : 18kg

(3) SD : SD series robot

: Arm extension model (4) L : Clean room model C

LC : Clean room arm

extension model

(5) Dimension and Ambient specification:

[none]: driven by R/C

CR3D-7*1M (for RV-12SD)

CR2D-7*1 / CR2DA-7*1 (for RV-6SD)

SM6xx: Oil mist model driven by R/C

CR3D-7*1M-SM6xx (only RV-6SD)

SULxx:UL specification/driven by R/C

CR3D-7*1M-SULxx (for RV-12SD)

CR2D-7*1-SULxx (for RV-6SD)

SULM6xx:UL specification/

Oil mist model driven by R/C

CR3D-7*1M-SULM6xx(only RV-6SD)

: driven by R/C CR2D-7*1-S3xx/ CR2DA-7*1-S3xx(only RV-12SD) S3xx

Group C Model name description is shown as follows.

<u>RV-3</u> SD J B <u>x - x</u>

(6) (7) (1)(2)(3)(4)(5)

(1) V: Vertical Robot

(2) Rated Payload specification:

3 : 3kg

(3) SD : SD series robot

(4) J : 5 axes exist [none]: 6 axes exist

: All axes are equipped with brake (5) **B**

[none]: Basic model

J4 axis and J6 axis are not equipped with brake.

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: Clean room model (6) C

[none] : Basic model

(7) Special specification number

Pilot number and specification as follows : driven by R/C CR1DA-7*1-Sxx Sxx

: driven by R/C CR2D-7*1-S3xx/ CR2DA-7*1-S3xx S3xx

SM6xx: R/C Oil mist model

driven by R/C CR3D-7*1M-SM6xx

SUL3xx: UL specification and R/C Oil mist model

driven by R/C CR2D-7*1-SUL3xx

SULM6xx: UL specification R/C Oil mist model driven by R/C CR3D-7*1M-SULM6xx

Group D Model name description is shown as follows.

RH-x SDH xx xx x - xx

(1) (2) (3)

(4)

(5) (6) (7)

(1)H: Horizontal Robot

(2) Maximum Payload specification:

6 : 6kg 12 : 12kg

18 : 18kg

20 : 20kg

(3) SD : SD series robot

(4) Arm length(No1 and No2 arm) specification:

: 700 mm arm 35 : 350 mm arm 70

85 : 850 mm arm 45 : 450 mm arm

100

55 : 550 mm arm (5) Z axis working area specification:

: 320 mm arm : 170 mm arm 32 17

: 200 mm arm 35 : 350 mm arm 20 : 380 mm arm : 270 mm arm 38 27

: 450 mm arm : 300 mm arm 45 30

(6) Dimension and Ambient specification:

: Oil mist model M

: Clean room model C

[none]: Basic model

: 1000 mm arm

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(7) Optional specification:

: RH-6SDH driven by R/C CR1DA-7*1-Sxx Sxx

RH-12/18/20SDH driven by R/C CR2D-7*1-Sxx/ R/C CR2DA-7*1-Sxx

S3xx: driven by R/C CR2D-7*1-S3xx/ CR2DA-7*1-S3xx

(only RH-6SDH)

SM6xx: Oil mist model driven by R/C

CR3D-7*1M-SM6xx

SULxx: UL specification driven by R/C

CR3D-7*1M-SULxx (only RH-12 / 18SDH)

SUL3xx: UL specification driven by R/C

CR2D-7*1-SUL3xx (only RH-6SDH)

SULM6xx:UL specification /

Oil mist model driven by R/C

CR3D-7*1M-SULM6xx (only RV-12 / 18SDH)

Group E Model name description is shown as follows.

SD B RV-2 - <u>×</u> (5)(1)(2)(3)(4)

(1) V: Vertical Robot

(2) Rated Payload specification:

2 : 2kg

(3) SD : SD series robot

: All axes are equipped with brake

[none]: Basic model

J4 axis and J6 axis are not equipped with brake.

(5) Special specification number

Pilot number and specification as follows

: driven by R/C CR1DA-77*-Sxx Sxx

: machine cable connectors (between Robot arm and Robot controller) are original **S12**

square type.

driven by R/C CR1DA-77*-S12

Attachment

Statement No.

E6 12 07 25554 044



Group F Model name description is shown as follows.

RH-3 SDHR XX XX X X - XX

(1) (2) (3)

(4) (5) (6) (7) (8)

(9)

(1)H: Horizontal Robot

(2) Maximum Payload specification:

: 3ka

(3) SD : SD series robot

: Reverse mount model (4) R

(5) Arm length(No1 and No2 arm) specification:

: 350 mm arm 35 : 550 mm arm 55

(6) Z axis working area specification:

12 : 120 mm arm 15 : 150 mm arm

(7) Dimension and Ambient specification:

[none] : Basic model

M : Oil mist model

: Water proof model W

C : Clean room model

(8) Special specification:

W : Basic model

: the special machine cable model driven by CR1DA-781-Sxx N

: Basic model ,regular type (same with "W") [none]

(9) Optional specification:

: RH-3SDHRxxxxN driven by R/C, CR1DA-781-Sxx Sxx

RH-3SDHRxxxxW

driven by R/C, CR2DA-781-Sxx and RH-3SDHRxxxx

SM6xx: Oil mist model driven by R/C, CR3D-781M-SM6xx

SULxx: UL specification driven by R/C, CR3D-781M-SULxx

SULM6xx:UL specification /Oil mist model driven by R/C, CR3D-781M-SULM6xx

Attachment

Statement No.

E6 12 07 25554 044



Group G Model name description is shown as follows.

(5)

RP-x A DH xxx - xx

(1) (2) (3) (4)

(6)

(1)P: Parallel rink Robot

(2) Maximum Payload specification:

: 1kg 3 : 3kg 5 : 5kg

: A series robot (3) A : stand alone type (4) **D**

(5) Dimension and Ambient specification

L : Arm extension model : Clean room model C W : Water proof model

LC: Clean room, Long arm model LW: Water proof, long arm model

[none] :standard model (6) Optional specification: [none] :standard model

Sxx: Shipping specification



EC Declaration of Conformity

We, the undersigned,

Manufacturer	MITSUBISHI ELECTRIC CORPORATION NAGOYA WORKS		
Address, City	1-14,Yada-minami 5-chome, Higashi-ku, Nagoya 461-8670		
Country	Japan		
Phone number	+81 52 712 2354		
Fax number/e-mail	+81 52 722 0384		
Authorized representative in Europe	MITSUBISHI Electric Europe B.V		
Address, City	40880 Ratingen		
Country	Germany		

Certify and declare under our sole responsibility that the following apparatus:

Type Name	Industrial Robot
Manufacturer	MITSUBISHI ELECTRIC CORPORATION NAGOYA WORKS
Brand	MELFA
Model No.	SD series
Restrictive use	For industrial environment only

Conforms with the essential requirements of the EMC Directive 2004/108/EC and the Machinery Directive 2006/42/EC, based on the following specifications applied:

EU Harmonized Standa	Non-harmonized Standard	
EMC(2004/108/EC)	EN61000-6-4:2007	N/A
	EN61000-6-2:2005	
Machinery (2006/42/EC)	Type A:Fundamental safety standards	N/A
	EN ISO12100-1:2003	
	EN ISO12100-2:2003	
	EN 1050:1997	·
	Type B:Group safety standards	
	B1:Safety aspects	
	EN60204-1:2006, EN294:1992, EN349:1993	
	ISO13849-1:2006	
	Type C:Machine Safety standard	
	ISO10218-1:2011	

and therefore complies with the essential requirements and provisions of the EMC Directive and the Machinery Directive.



The Technical documentation is kept at the following address:

Company	MITSUBISHI Electric Europe B.V		
Address, City	Gothaer St. 8 40880 Ratingen		
Country	Germany		
Phone number	+49 2102 486 0		
Fax number	+49 2102 486 1120		

< Partly completed Machinery>

This product meets the specification and/or the performance by correct installing.

So it must not be used until being installed into the final machinery of the customer.

Date	June 14, 2012
Name and position of person	
binding the manufacturer	Tomouki Kobayashi
	Tomoyuki Kobayashi
	Senior Manager
	Robot Manufacturing Department
	MITSUBISHI ELECTRIC CORPORATION NAGOYA WORKS

■ Declaration Type of models

Table 1 : The list of RV-12SD series for grouping certification. ; A group

	·	Model name	
No.	Classification	12/18kg-Load	Robot Controller
1	Oil mist basic model	RV-12SD(-S**)	
2	Oil mist arm extension model RV-12SDL(-S**)		CR3D-701M(-S**)
3	Oil mist /heavy load model	Oil mist /heavy load model RV-18SD(-S**)	
4	Clean room basic model (Class 10)	RV-12SDC(-S**)	
5	Clean room arm extension model (Class 10)	RV-12SDLC(-S**)	CR3D-701(-S**)
6	Clean room /heavy load model (Class 10)	RV-18SDC(-S**)	
7	Oil mist basic model , 1Phase Power model Robot controller	RV-12SD-S3**	
8	Oil mist arm extension model, with 1Phase Power model Robot controller	RV-12SDL-S3**	CR2D-701-\$3**/
9	Clean room basic model (Class 10) 1Phase Power model Robot controller	RV-12SDC-S3**	CR2DA-701-S3**
10	Clean room arm extension model (Class 10) with 1Phase Power model Robot controller	RV-12SDLC-S3**	
11	UL specification oil mist basic model with 1Phase Power model Robot controller	RV-12SD-SUL3**	
12	UL specification oil mist arm extension model with 1Phase Power model Robot controller	RV-12SDL-SUL3**	
13	UL specification oil mist basic model with 1Phase Power model Robot controller	RV-12SDC-SUL3**	CR2D-701-SUL3**
14	UL specification oil mist arm extension model with 1Phase Power model Robot controller	RV-12SDCL-SUL3**	
15	UL specification oil mist basic model including oil mist model robot controller	RV-12SD-SUL**	
16	UL specification oil mist arm extension model including oil mist model robot controller	RV-12SDL-SUL**	CR3D-701M-SUL**
17	UL specification oil mist basic model including oil mist model robot controller	RV-12SDC-SUL**	
18	UL specification oil mist arm extension model including oil mist model robot controller	RV-12SDCL-SUL**	CR3D-701-SUL**
19	UL specification clean room / heavy load model	RV-18SD-SUL**	CR3D-709M-SUL**
20	UL specification clean room / heavy load model	RV-18SDC-SUL**	CR3D-709-SUL**

Table 2 : The list of RV-6SD series for grouping certification. B group

No.	Classification	Model name 6kg-Load	Robot Controller
1	Oil mist basic model	RV-6SD(-S**)	CR2D-711(-S**) / CR2DA-711(-S**)
2	Oil mist arm extension model	RV-6SDL(-S**)	
3	Clean room basic model (Class 10)	RV-6SDC(-S**)	
4	Clean room arm extension model (Class 10)	RV-6SDLC(-S**)	
5	Oil mist basic model including oil mist model robot controller	RV-6SD-SM6**	CR3D-711M(-S**)
6	Oil mist arm extension model including oil mist model robot controller	RV-6SDL-SM6**	
7	UL specification oil mist basic model	RV-6SD-SUL**	CR2D-711-SUL**
8	UL specification oil mist arm extension model	RV-6SDL-SUL**	
9	UL specification clean room basic model (Class 10)	RV-6SDC-SUL**	
10	UL specification clean room arm extension model (Class 10)	RV-6SDLC-SUL**	
11	UL specification oil mist basic model including oil mist model robot controller	RV-6SD-SULM6**	- CR3D-711M-SULM6**
12	UL specification oil mist arm extension model including oil mist model robot controller	RV-6SDL-SULM6**	

Table 3: The list of RV-3SD series robots for grouping certification; C group-1.

No.	Classification	Model name	Robot Controller
		6-axis	
1	Basic model (standard)	RV-3SD-S3**	CR2D-721-S3**/ CR2DA-721-S3**
2	Clean room basic model (standard)	RV-3SDC-S3**	
3	Basic model with brakes on all axis (standard)	RV-3SDB-S3**	
4	Clean room basic model with brakes on all axis (standard)	RV-3SDBC-S3**	
5	Oil mist basic model including robot controller *1	RV-3SD-SM6**	CR3D-721M-SM6**
6	Oil mist basic model with brakes on all axis including robot controller	RV-3SDB-SM6**	
7	UL specification and basic model with brakes on all axis (standard)	RV-3SDB-SUL3**	- CR2D-721-SUL3**
8	UL specification clean room basic model with brakes on all axis (standard)	RV-3SDBC-SUL3**	
9	UL specification oil mist basic model with brakes on all axis including robot controller	RV-3SDB-SULM6**	CR3D-721M-SULM6**

Table 4: The list of RV-3SD series robots for grouping certification; C group-2

No.	Classification	Model name 6-axis	Robot Controller
10	Basic model (standard) *1	RV-3SD(-S**)	CR1DA-721(-S**)
11	Clean room basic model (standard) *1	RV-3SDC(-S**)	
12	Basic model with brakes on all axis (standard)	RV-3SDB(-S**)	
13	Clean room basic model with brakes on all axis (standard)	RV-3SDBC(-S**)	

Table 5: The list of RV-3SD series robots for grouping certification; C group -3.

No.	Classification	Model name	Robot Controller
		5-axis	
14.	Basic model (standard)	RV-3SDJ-S3**	CR2D-731-S3**/ CR2DA-731-S3**
15	Clean room basic model (standard)	RV-3SDJC-S3**	
16	Basic model with brakes on all axis (standard)	RV-3SDJB-S3**	
17	Clean room basic model with brakes on all axis (standard)	RV-3SDJBC-S3**	
18	Oil mist basic model including robot controller *1	RV-3SDJ-SM6**	CR3D-731M-SM6**
19	Oil mist basic model with brakes on all axis including robot controller	RV-3SDJB-SM6**	
20	UL specification basic model with brakes on all axis (standard)	RV-3SDJB-SUL3**	CR2D-731-SUL3**
21	UL specification clean room basic model with brakes on all axis (standard)	RV-3SDJBC-SUL3**	
22	UL specification oil mist basic model with brakes on all axis including robot controller	RV-3SDJB-SULM6**	CR3D-731M-SULM6**

Table 6: The list of RV-3SD series robots for grouping certification; C group -4.

No.	Classification	Model name	Robot Controller
		5-axis	
23	Basic model (standard) *1	RV-3SDJ(-S**)	CR1DA-731(-S**)
24	Clean room basic model (standard) *1	RV-3SDJC(-S**)	
25	Basic model with brakes on all axis (standard)	RV-3SDJB(-S**)	
26	Clean room basic model with brakes on all axis (standard)	RV-3SDJBC(-S**)	

Table 7: The list of RH-xSDH robots for grouping certification; D group-1.

		Model name		
No.	Classification	6kg-Load	Robot Controller	
1	Basic model	RH-6SDH4520-S3**		
2	Short arm model	RH-6SDH3520-S3**		
3	Long arm model	RH-6SDH5520-S3**		
4	Oil mist model	RH-6SDH4517M-S3**	CR2D-761	
5	Short arm/Oil mist model	RH-6SDH3517M-S3**	-\$3**/	
6	Long arm/Oil mist model	RH-6SDH5517M-S3**	CR2DA-761 -S3**	
7	Clean room model (Class 10)	RH-6SDH4517C-S3**	-33	
8	Short arm/Clean room model	RH-6SDH3517C-S3**	-	
9	Long arm/Clean room model	RH-6SDH5517C-S3**		
10	Oil mist model including R/C	RH-6SDH4517M-SM6**		
11	Short arm/Oil mist model including R/C	RH-6SDH3517M-SM6**	CR3D-761M	
12	Long arm/Oil mist model including R/C	RH-6SDH5517M-SM6**	-SM6**	
13	UL specification basic model	RH-6SDH4520-SUL3**		
14	UL specification short arm model	RH-6SDH3520-SUL3**		
15	UL specification long arm model	RH-6SDH5520-SUL3**		
16	UL specification oil mist model	RH-6SDH4517M-SUL3**	T	
17	UL specification short arm/Oil mist model	RH-6SDH3517M-SUL3**	- CR2D-761 - SUL3**	
18	UL specification long arm/Oil mist model	RH-6SDH5517M-SUL3**	-50L3""	
19	UL specification clean room model (Class 10)	RH-6SDH4517C-SUL3**		
20	UL specification short arm/Clean room model	RH-6SDH3517C-SUL3**		
21	UL specification long arm/Clean room model	RH-6SDH5517C-SUL3**		
22	UL specification oil mist model including R/C	RH-6SDH4517M-SULM6**		
23	UL specification short arm/Oil mist model including R/C	RH-6SDH3517M-SULM6**	CR3D-761M	
24	UL specification long arm/Oil mist model including R/C	RH-6SDH5517M-SULM6**	-SULM6**	

Table 8 : The list of RH-xSDH robots for grouping certification; D group-2.

No.	Classification	Model name 6kg-Load	Robot Controller
25	Basic model	RH-6SDH4520-S**	
26	Short arm model	RH-6SDH3520-S**	
27	Long arm model	RH-6SDH5520-S**	
28	Oil mist model	RH-6SDH4517M-S**	CR1DA-761
29	Short arm/Oil mist model	RH-6SDH3517M-S**	-S**
30	Long arm/Oil mist model	RH-6SDH5517M-S**	
31	Clean room model (Class 10)	RH-6SDH4517C-S**	
32	Short arm/Clean room model	RH-6SDH3517C-S**	
33	Long arm/Clean room model	RH-6SDH5517C-S**	

Table 9 : The list of RH-xSDH robots for grouping certification; D group -3.

No.	Classification	Model name	 Robot Controller
		12∕18kg-Load	NOSOT GONTION
34	Basic model	RH-12SDH7035(-S**)	CR2D-741(-S**)/
35	Short arm model	RH-12SDH5535(-S**)	CR2D-741(-5)/
36	Long arm model	RH-12SDH8535(-S**)	OKLEATING ,
37	Long arm and heavy load model	RH-18SDH8535(-S**)	CR2D-751(-S**)/ CR2DA-751(-S**)
38	Oil mist model	RH-12SDH7030M(-S**)	CD2D 744(6**)/
39	Short arm/Oil mist model	RH-12SDH5530M(-S**)	CR2D-741(-S**)/ CR2DA-741(-S**)
40	Long arm/Oil mist model	RH-12SDH8530M(-S**)	ORZDA-141(-3)
41	Long arm and heavy load/Oil mist model	RH-18SDH8530M(-S**)	CR2D-751(-S**)/ CR2DA-751(-S**)
42	Clean room model (Class 10)	RH-12SDH7030C(-S**)	CD2D 744/ C++)/
43	Short arm/Clean room model	RH-12SDH5530C(-S**)	CR2D-741(-S**)/ CR2DA-741(-S**)
44	Long arm/Clean room model	RH-12SDH8530C(-S**)	CR2DA-741(-5)
45	Long arm and heavy load/Clean room model (Class 10)	RH-18SDH8530C(-S**)	CR2D-751(-S**)/ CR2DA-751(-S**)
46	Oil mist model including R/C	RH-12SDH7030M-SM6**	ODOD 744M
47	Short arm/Oil mist model including R/C	RH-12SDH5530M-SM6**	- CR3D-741M - SM6**
48	Long arm/Oil mist model including R/C	RH-12SDH8530M-SM6**	-31/10
49	Long arm and heavy load / Oil mist model including R/C	RH-18SDH8530M-SM6**	CR3D-751M -SM6**
50	UL specification basic model	RH-12SDH7035-SUL**	
51	UL specification short arm model	RH-12SDH5535-SUL**	CR2D-741-SUL**
52	UL specification long arm model	RH-12SDH8535-SUL**	
53	UL specification long arm and heavy load model	RH-18SDH8535-SUL**	CR2D-751-SUL**
54	UL specification oil mist model	RH-12SDH7030M-SUL**	
55	UL specification short arm/Oil mist model	RH-12SDH5530M-SUL**	CR2D-741-SUL**
56	UL specification long arm/Oil mist model	RH-12SDH8530M-SUL**	
57	UL specification long arm and heavy load/ Oil mist model	RH-18SDH8530M-SUL**	CR2D-751-SUL**
58	UL specification clean room model (Class 10)	RH-12SDH7030C-SUL**	
59	UL specification short arm/Clean room model	RH-12SDH5530C-SUL**	CR2D-741-SUL**
60	UL specification long arm/Clean room model	RH-12SDH8530C-SUL**	
61	UL specification long arm and heavy load/ Clean room model (Class 10)	RH-18SDH8530C-SUL**	CR2D-751-SUL**
62	UL specification oil mist model including R/C	RH-12SDH7030M -SULM6**	
63	UL specification short arm/Oil mist model including R/C	RH-12SDH5530M -SULM6**	CR3D-741M -SULM6**
64	UL specification long arm / Oil mist model including R/C	RH-12SDH8530M -SULM6**	
	UL specification long arm and heavy load/	RH-18SDH8530M	CR3D-751M
65	Oil mist model including R/C	-SULM6**	-SULM6**

Table 10 : The list of robots for grouping certification; D group -4.

No.	Classification	Model name 6kg-Load	Robot Controller
66	Z-Stroke variation , Basic model	RH-6SDH4532(-S**)	
67	Z-Stroke variation , Short arm model	RH-6SDH3532(-S**)	
68	Z-Stroke variation , Long arm model	RH-6SDH5532(-S**)	
69	Z-Stroke variation , Oil mist model	RH-6SDH4527M(-S**)	CR1DA-761
70	Z-Stroke variation , Short arm/Oil mist model	RH-6SDH3527M(-S**)	(-S**)
71	Z-Stroke variation , Long arm/Oil mist model	RH-6SDH5527M(-S**)	
72	Z-Stroke variation , Clean room mode! (Class 10)	RH-6SDH4527C(-S**)	
73	Z-Stroke variation , Short arm/Clean room model	RH-6SDH3527C(-S**)	
74	Z-Stroke variation ,Long arm/Clean room model	RH-6SDH5527C(-S**)	

RV-3SD is the test models.

Table 11: The list of robots for grouping certification; D group-5.

	· · · · · · · · · · · · · · · · · · ·	Model name	Robot
No.	Classification	6kg-Load	Controller
75	Z-Stroke variation , Basic model	RH-6SDH4532-S3**	Controller
76	Z-Stroke variation , Short arm model		
77		RH-6SDH3532-S3**	
78	Z-Stroke variation, Long arm model	RH-6SDH5532-S3**	
79	Z-Stroke variation, Oil mist model	RH-6SDH4527M-S3**	6D2D4 764
80	Z-Stroke variation, Short arm / Oil mist model	RH-6SDH3527M-S3**	CR2DA-761 -S3**
81	Z-Stroke variation , Long arm / Oil mist model	RH-6SDH5527M-S3**	-53**
01	Z-Stroke variation, Clean room model (Class 10)	RH-6SDH4527C-S3**	-
82	Z-Stroke variation ,Short arm / Clean room	RH-6SDH3527C-S3**	
00	model		
83	Z-Stroke variation, Long arm/Clean room model	RH-6SDH5527C-S3**	
84	Z-Stroke variation ,Qil mist model including	RH-6SDH4527M-SM6**	
	R/C		
85	Z-Stroke variation , Short arm / Oil mist model	RH-6SDH3527M-SM6**	CR3D-761M
	including R/C		-SM6**
86	Z-Stroke variation , Long arm/Oil mist model	RH-6SDH5527M-SM6**	
	including R/C		
87	Z-Stroke variation ,UL specification basic model	RH-6SDH4532-SUL3**	
88	Z-Stroke variation, UL specification short arm model	RH-6SDH3532-SUL3**	
89	Z-Stroke variation, UL specification long arm model	RH-6SDH5532-SUL3**	
90	Z-Stroke variation ,UL specification oil mist model	RH-6SDH4527M-SUL3**	
91	Z-Stroke variation, UL specification short arm ZOII mist model	RH-6SDH3527M-SUL3**	CR2D-761 -SUL3**
92	Z-Stroke variation ,UL specification long arm /Oil mist model	RH-6SDH5527M-SUL3**	
93	Z-Stroke variation ,UL specification clean room model (Class 10)	RH-6SDH4527C-SUL3**	
94	Z-Stroke variation, UL specification short arm Clean room model	RH-6SDH3527C-SUL3**	
95	Z-Stroke variation, UL specification long arm /Clean room model	RH-6SDH5527C-SUL3**	
96	Z-Stroke variation , UL specification oil mist model including R/C	RH-6SDH4527M-SULM6**	
97	Z-Stroke variation, UL specification short arm Oil mist model including R/C	RH-6SDH3527M-SULM6**	CR3D-761M -SULM6**
98	Z-Stroke variation, UL specification long arm /Oil mist model including R/C	RH-6SDH5527M-SULM6**	

RV-12SDL-SUL** and RV-6SDL-SUL** are the tested models.

Table 12: The list of RH-xSDH robots for grouping certification; D group -6.

No.	Classification	Model name	Robot Controller
110.		12/18kg-Load	KODOL GOILLOTTEI
99	Z-Stroke variation , Basic model	RH-12SDH7045(-S**)	
100	Z-Stroke variation , Short arm model	RH-12SDH5545(-S**)	
101	Z-Stroke variation ,Long arm model	RH-12SDH8545(-S**)	·
102	Z-Stroke variation ,Oil mist model	RH-12SDH7038M(-S**)	
103	Z-Stroke variation , Short arm/Oil mist model	RH-12SDH5538M(-S**)	CR2DA-741(-S**)
104	Z-Stroke variation , Long arm/Oil mist model	RH-12SDH8538M(-S**)	
105	Z-Stroke variation , Clean room model (Class 10)	RH-12SDH7038C(-S**)	
106	Z-Stroke variation , Short arm/Clean room model	RH-12SDH5538C(-S**)	
107	Z-Stroke variation , Long arm/Clean room model	RH-12SDH8538C(-S**)	
108	Z-Stroke variation , Oil mist model including R/C	RH-12SDH7038M-SM6**	
109	Z-Stroke variation ,Short arm/Oil mist model including R/C	RH-12SDH5538M-SM6**	CR3D-741M -SM6**
110	Z-Stroke variation ,Long arm / Oil mist model including R/C	RH-12SDH8538M-SM6**	Sino
111	Z-Stroke variation, UL specification basic model	RH-12SDH7045-SUL**	
112	Z-Stroke variation ,UL specification short arm model	RH-12SDH5545-SUL**	
113	Z-Stroke variation ,UL specification long arm model	RH-12SDH8545-SUL**	
114	Z-Stroke variation ,UL specification oil mist model	RH-12SDH7038M-SUL**	
115	Z-Stroke variation ,UL specification short arm /Oil mist model	RH-12SDH5538M-SUL**	CR2D-741-SUL**
116	Z-Stroke variation ,UL specification long arm/ Oil mist model	RH-12SDH8538M-SUL**	
117	Z-Stroke variation ,UL specification clean room model (Class 10)	RH-12SDH7038C-SUL**	
118	Z-Stroke variation ,UL specification short arm // Clean room model	RH-12SDH5538C-SUL**	
119	Z-Stroke variation , UL specification long arm/ Clean room model	RH-12SDH8538C-SUL**	
120	Z-Stroke variation ,UL specification oil mist model including R/C	RH-12SDH7038M -SULM6**	
121	Z-Stroke variation ,UL specification short arm /Oil mist model including R/C	RH-12SDH5538M -SULM6**	CR3D-741M -SULM6**
122	Z-Stroke variation ,UL specification long arm/ Oil mist model including R/C	RH-12SDH8538M -SULM6**	

Table 13: The list of RH-xSDH robots for grouping certification; D group -7.

No.	Classification	Model name	Robot Controller
		20kg-Load	
123	Heavy load variation Basic model	RH-20SDH8545 (-S**)	
124	Heavy load variation ,Short Z-Stroke model	RH-20SDH8535(-S**)	
125	Heavy load variation , Long arm model	RH-20SDH10045(-S**)	
126	Heavy load variation , Long arm and Short Z-Stroke model	RH-20SDH10035(-S**)	
127	Heavy load variation / Oil mist model	RH-20SDH8538M(-S**)	
128	Heavy load variation , Short Z-Stroke /Oil mist model	RH-20SDH8530M(-S**)	CR2DA-751(-S**)
129	Heavy load variation , Long Arm /Oil mist model	RH-20SDH10038M(-S**)	
130	Heavy load variation, Long arm and Short Z-Stroke /Oil mist model	RH-20SDH10030M(-S**)	
131	Heavy load variation /Clean room model	RH-20SDH8538C(-S**)	
132	Heavy load variation , Short Z-Stroke /Clean room model	RH-20SDH8530C(-S**)	
133	Heavy load variation, Long arm /Clean room model	RH-20SDH10038C(-S**)	1
134	Heavy load variation, Long arm and Short Z-Stroke /Clean room model	RH-20SDH10030C(-S**)	
135	Heavy load variation / Oil mist model including R/C	RH-20SDH8538M-SM6**	
136	Heavy load variation , Short Z-Stroke /Oil mist model including R/C	RH-20SDH8530M-SM6**	CR3D-751M
137	Heavy load variation , Long Arm /Oil mist model including R/C	RH-20SDH10038M-SM6**	-SM6**
138	Heavy load variation Long arm and Short Z-Stroke /Oil mist model including R/C	RH-20SDH10030M-SM6**	
139	Heavy load variation , Basic model	RH-20SDH8545 -SUL**	
140	Heavy load variation , Short Z-Stroke model	RH-20SDH8535-SUL**	
141	Heavy load variation , Long arm model	RH-20SDH10045-SUL**	
142	Heavy load variation , Long arm and Short Z-Stroke model	RH-20SDH10035-SUL**	
143	Heavy load variation / Oil mist model	RH-20SDH8538M-SUL**	
144	Heavy load variation , Short Z-Stroke /Oil mist model	RH-20SDH8530M-SUL**	CR2D-751
145	Heavy load variation , Long Arm /Oil mist model	RH-20SDH10038M-SUL**	61U ++
146	Heavy load variation, Long arm and Short Z-Stroke /Oil mist model	RH-20SDH10030M-SUL**	-SUL**
147	Heavy load variation /Clean room model	RH-20SDH8538C-SUL**	
148	Heavy load variation , Short Z-Stroke /Clean room model	RH-20SDH8530C-SUL**	
149	Heavy load variation, Long arm /Clean room model	RH-20SDH10038C-SUL**	
150	Heavy load variation, Long arm and Short Z-Stroke /Clean room model	RH-20SDH10030C-SUL**	
151	Heavy load variation / Oil mist model including R/C	RH-20SDH8538M-SULM6**	
152	Heavy load variation , Short Z-Stroke /Oil mist model including R/C	RH-20SDH8530M-SULM6**	CR3D-751M
153	Heavy load variation ,Long Arm /Oil mist model including R/C	RH-20SDH10038M-SULM6**	-SULM6**
154	Heavy load variation, Long arm and Short Z-Stroke /Oil mist model including R/C	RH-20SDH10030M-SULM6**	

Table 14: The list of RV-2SD robots for grouping certification; E group.

No.	Classification	Model name	Dahat Cantuallar
NU.		6-axis	Robot Controller
1	Basic model (standard) *1	RV-2SD(-S**)	CR1DA-771(-S**)
2	Basic model with brakes on all axis	RV-2SDB(-S**)	CR1DA-772(-S**)
3	Special machine cable model *1	RV-2SD-S12	CR1DA-771-S12
4	Special machine cable model with brakes on all axis	RV-2SDB-S12	CR1DA-772-S12

Table 15: The list of RH-3SDHR series robots for grouping certification; F group -1.

No.	Classification	Model name	Robot Controller
		4-axis	
1	Basic model	RH-3SDHR3515W(-S**)	CR2DA-781(-S**)
2	Special machine cable model	RH-3SDHR3515N (-S**)	CR1DA-781(-S**)
3	Oil mist model	RH-3SDHR3512MW (-S**)	CR2DA-781(-S**)
4	Oil mist model including R/C	RH-3SDHR3512MW -SM6**	CR3D-781M-SM6**
5	Long arm model	RH-3SDHR5515W(-S**)	CR2DA-781(-\$**)
6	Special machine cable model, Long arm type	RH-3SDHR5515N (-S**)	CR1DA-781(-S**)
7.	Oil mist model, Long arm type	RH-3SDHR5512MW (-S**)	CR2DA-781(-\$**)
8	Oil mist model including R/C, Long arm type	RH-3SDHR5512MW -SM6**	CR3D-781M-SM6**
9	UL specific type	RH-3SDHR3515W-SUL**	CR2DA-781-SUL**
10	Oil mist model, UL specific type	RH-3SDHR3512MW-SUL**	CR2DA-781(-S**)
11	Oil mist model including R/C, UL specific model	RH-3SDHR3512MW -SULM6**	CR3D-781M-SULM6**
12	Long arm model ,UL specific type	RH-3SDHR5515W-SUL**	CR2DA-781-SUL**
13	Oil mist model, Long arm and UL specific type	RH-3SDHR5512MW -SUL**	CR2DA-781-SUL**
14	Oil mist model including R/C, Long arm and UL specific type	RH-3SDHR5512MW -SULM6**	CR3D-781M-SULM6**
15	Basic model, regular type	RH-3SDHR3515(-S**)	CR2DA-781(-S**)
16	Oil mist model , regular type	RH-3SDHR3512M (-S**)	CR2DA-781(-\$**)
17	Oil mist model including R/C, regular type	RH-3SDHR3512M -SM6**	CR3D-781M-SM6**
18	Long arm model、regular type	RH-3SDHR5515(-S**)	CR2DA-781(-S**)
19	Oil mist model , Long arm type, regular type	RH-3SDHR5512M (-S**)	CR2DA-781(-S**)
20	Oil mist model including R/C, Long arm type regular type	RH-3SDHR5512M -SM6**	CR3D-781M-SM6**
21	UL specific type, regular type	RH-3SDHR3515-SUL**	CR2DA-781-SUL**
22	Oil mist model, UL specific type regular type	RH-3SDHR3512M-SUL**	CR2DA-781(-S**)
23	Oil mist model including R/C,UL specific model regular type	RH-3SDHR3512M-SULM6**	CR3D-781M-SULM6**
24	Long arm model ,UL specific type	RH-3SDHR5515-SUL**	CR2DA-781-SUL**
25	Oil mist model , Long arm and UL specific type regular type	RH-3SDHR5512M-SUL**	CR2DA-781-SUL**
26	Oil mist model including R/C, Long arm and UL specific type regular type	RH-3SDHR5512M-SULM6**	CR3D-781M-SULM6**
27	Water proof model , regular type	RH-3SDHR3512W (-\$**)	CR2DA-781(-S**)
28	Clean room model (ISO Class 5), regular type	RH-3SDHR3512C (-S**)	CR2DA-781(-S**)
29	Water proof model including R/C, regular type	RH-3SDHR3512W -SM6**	CR3D-781M-SM6**

Table 16: The list of RH-3SDHR series robots for grouping certification; F group -2.

No.	Classification	Model name 4-axis	Robot Controller
30	Water proof model, UL specific type regular type	RH-3SDHR3512W -SUL**	CR2DA-781-SUL**
31	Clean room model (ISO Class 5), UL specific type regular type	RH-3SDHR3512C-SUL**	CR2DA-781-SUL**
32	Water proof model including R/C,UL specific model regular type	RH-3SDHR3512W-SULM6**	CR3D-781M-SULM6**
33	Water proof model , Long arm type, regular type	RH-3SDHR5512W (-S**)	CR2DA-781(-S**)
34	Clean room model (ISO Class 5), Long arm type, regular type	RH-3SDHR5512C (-S**)	CR2DA-781(-S**)
35	Water proof model including R/C, Long arm type, regular type	RH-3SDHR5512W -SM6**	CR3D-781M-SM6**
36	Water proof model, Long arm and UL specific type regular type	RH-3SDHR5512W -SUL**	CR2DA-781-SUL**
37	Clean room model (ISO Class 5), Long arm and UL specific type regular type	RH-3SDHR5512C-SUL**	CR2DA-781-SUL**
38	Water proof model including R/C, Long arm and UL specific model regular type	RH-3SDHR5512W-SULM6**	CR3D-781M-SULM6**

Table 17: The list of RP-1ADH series robots for grouping certification; G group.

No.	Classification	Model name 4-axis	Robot Controller
1	Basic model	RP-1ADH (-S**)	CR1DA-7A1(-S**)
2	Basic model,3kg load type	RP-3ADH (-S**)	CR1DA-7A1(-S**)
3	Basic model,5kg load type	RP-5ADH (-S**)	CR1DA-7A1(-S**)
4	Clean room model	RP-1ADHC(-S**)	CR1DA-7A1(-S**)
5	Clean room model,3kg load type	RP-3ADHC (-S**)	CR1DA-7A1(-S**)
6	Clean room model,5kg load type	RP-5ADHC (-S**)	CR1DA-7A1(-S**)
7	Water proof model	RP-1ADHW (-S**)	CR1DA-7A1(-S**)
8	Water proof model, 3kg load type	RP-3ADHW (-S**)	CR1DA-7A1(-S**)
9	Water proof model, 5kg load type	RP-5ADHW (-S**)	CR1DA-7A1(-S**)
10	Long arm model	RP-1ADHL (-S**)	CR1DA-7A1(-S**)
11	Long arm model / Clean room	RP-1ADHLC (-S**)	CR1DA-7A1(-S**)
12	Long arm model / Water proof	RP-1ADHLW (-S**)	CR1DA-7A1(-S**)

Revision history

Revision history	· 		· ·
Date	Specifications No.	Details of revisions	Rev.
September 22, 2008		First print	*
April 7,2009	P1	<authorized europe="" in="" representative=""></authorized>	Α
	·	Change to "Mitsubishi Electric Europe B.V"	-
		<machinery directive=""></machinery>	
		Added "EN954-1:1996"	
	P3 Table.1	RV-18SD,RV-18SDC,RV-18SD-SUL,RV-18SDC-SUL	
		added.	
October 13,2009	P1	Standards update(2006/42/EC)	В
March 15,2010	P7	Added RV-2SDseries	С
May 11, 2010	P4,P5	Added RV-3SD-Sxx series	D
	P6	Added RH-6SDH-Sxx series	
July 2, 2010	P3 Table 1	Added RV-12SD-S3xx series	E
·.	From P3 to P7	Added CR2DA-7xx controller	
September 3,2010	From P8 to P11	Added RH-xSH series to arm length, Z-Stroke length, and	F
		heavy load models	
October 1,2010	P12	Added RH-3SDHR series	G
November 9, 2010	P13	Added variation models("regular type") to RH-3SDHR	Н
		series	
January 26,2012	P1	Changed ISO10218-1 from 2006 version to 2011 version	J
February 20, 2012	P13,14	Added variation models(No.27 to 38) to RH-3SDHR series	K
June 14, 2012	P14	Added RP-1ADH series	L

<u>사용자안내문</u> User's Guide

기종별	사용자안내문		
Type of Equipment	User's Guide		
A 급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로합니다.		
Class A Equipment (Industrial Broadcasting & Communication Equipment)	This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.		
B급 기기 (가정용 방송통신기자재)	이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.		
Class B Equipment (For Home Use Broadcasting & Communication Equipment)	This equipment is home use (Class B) electromagnetic wave suitability equipment and to be used mainly at home and it can be used in all areas.		

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