Expanding Possibility

HYUNDAI ROBOTICS
HH Robot Series

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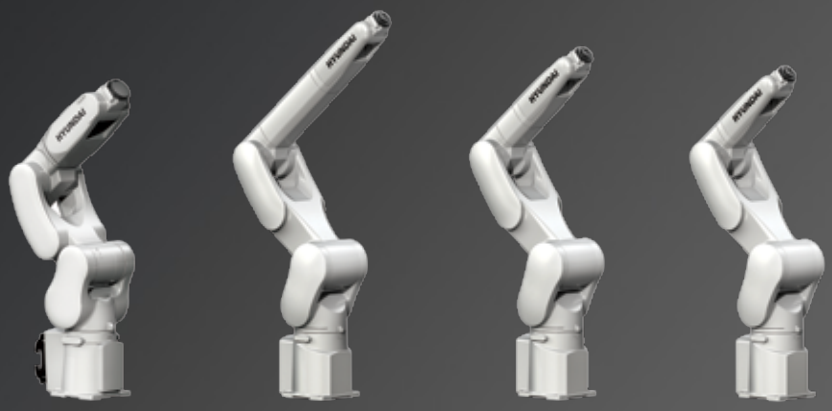
HH Series

HYUNDAI ROBOTICS HH Series



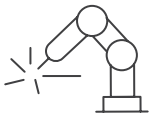
Special Feature

Light Robot, Less than 10kg

Easy installation with a light weight of 10kg.

Various Installation Location

Increased usability as it can be installed in various places such as the ground, wall, and ceiling.

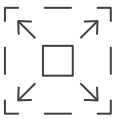


Minimal Design

The small size enables efficient space composition and interior.

Control Technology

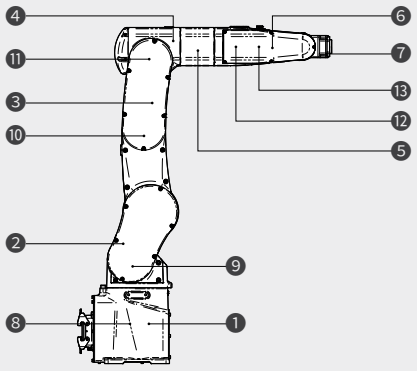
Convenient operation of robot with the latest control technology.



Wide Expandability

Useful after-care of robot through external expandability.

Part Name

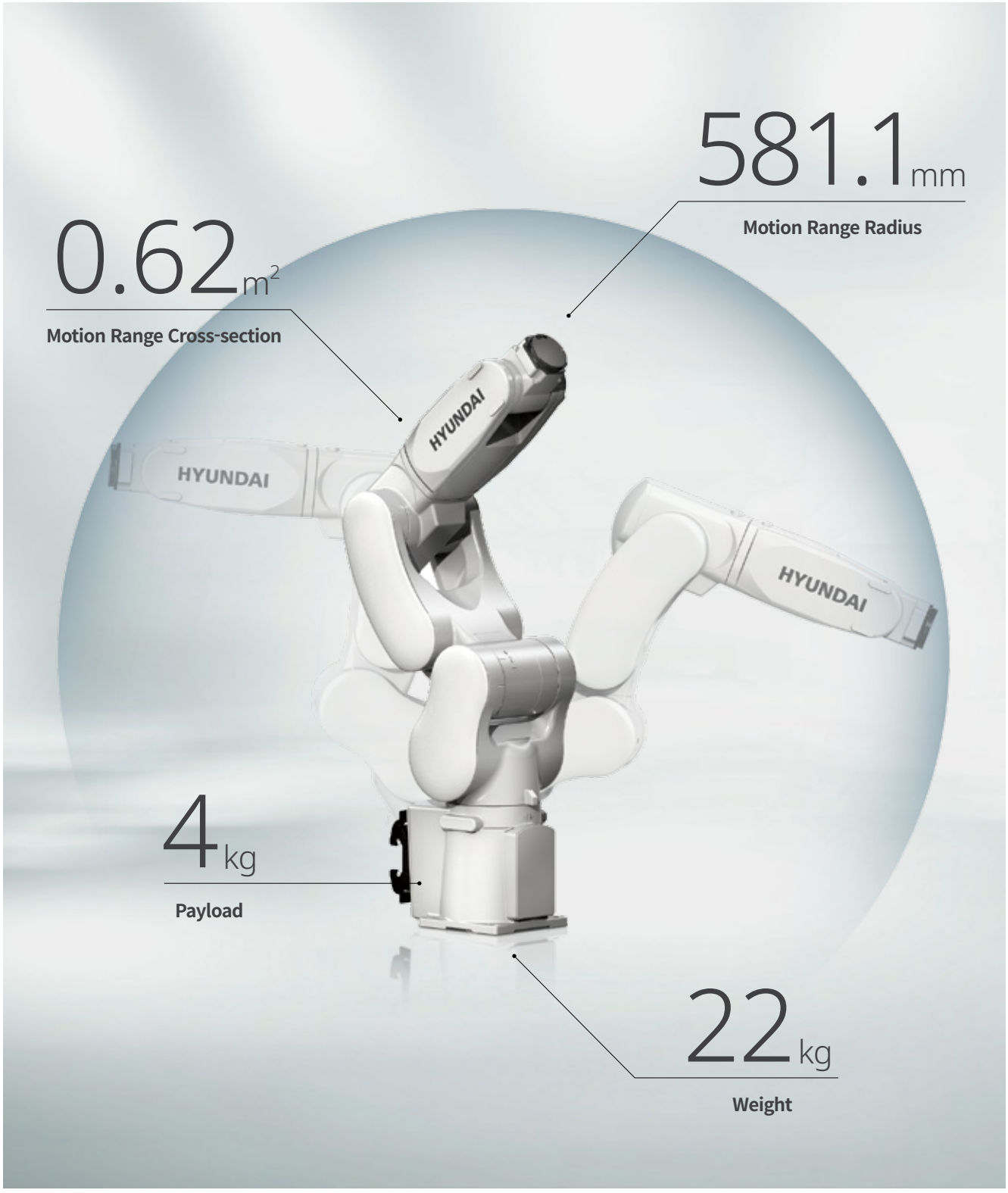


❶ Base Body
❷ Lower Frame
❸ Upper Frame
❹ Arm Frame
❺ Arm Pipe
❻ Wrist Body
❼ Wrist Holder
❽ S-axis motor
❾ H-axis motor
❿ V-axis motor
⓫ R2-axis motor
⓬ B-axis motor
⓭ R1-axis motor

High Speed Compact Handling Robot

HH4

Handling Sealing Assembly



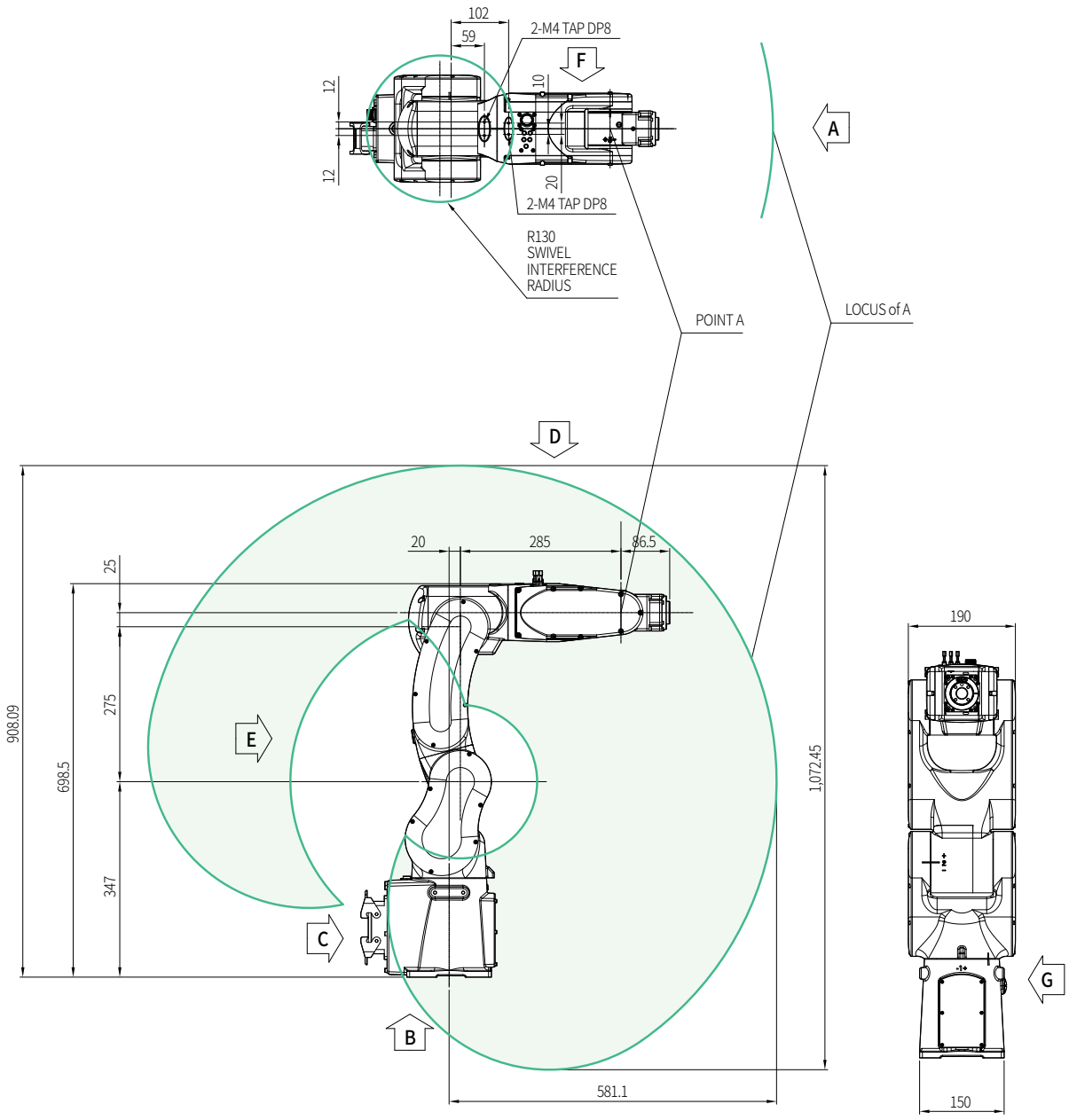
HH4 Features

Small Robot

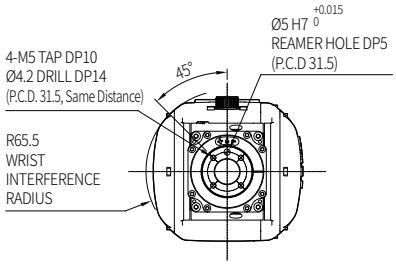
It's the smallest size robot of Hyundai Robotics.

Simple Functions

It can be used for simple work and precision work rather than for high function.

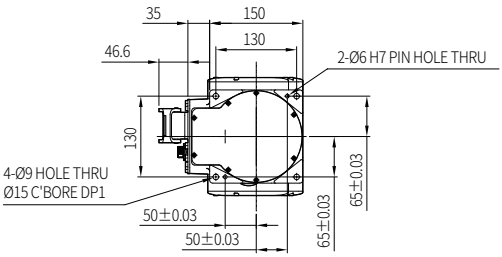


Wrist Mounting Section Detail Drawing



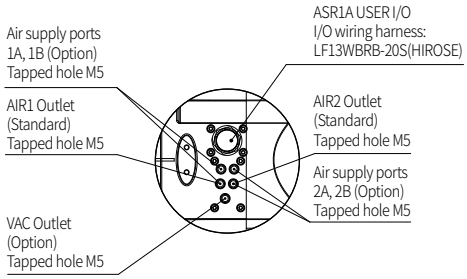
Detail "A"

Body Floor Mounting Dimensions



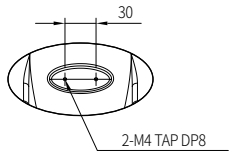
Detail "B"

Application Cable Connection Section



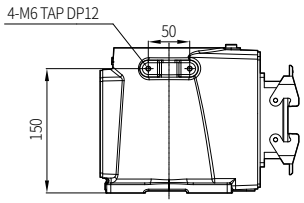
Detail "D"

Application Part Mounting Detail Drawing



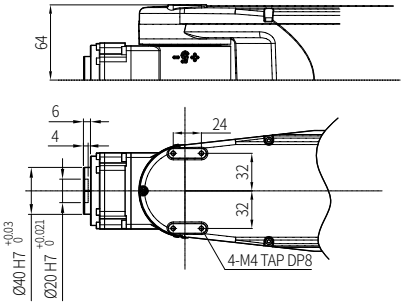
Detail "E"

Application Part Mounting Detail Drawing



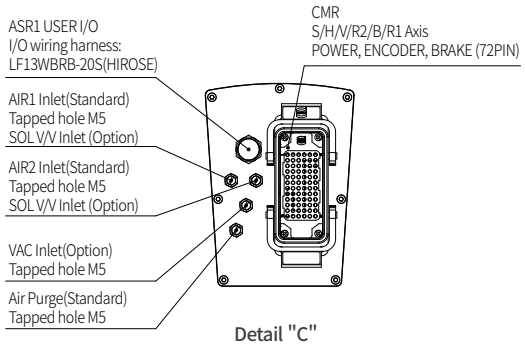
Detail "G"

Application Part Mounting Detail Drawing



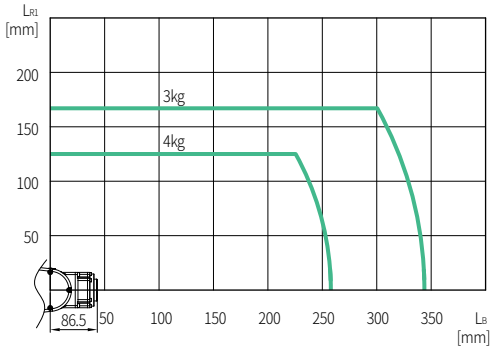
Detail "F"

Application Cable Connection Section (Option)



Detail "C"

Wrist Torque Diagram



Specifications

Item				Specification
Model				HH4
Payload			kg	4
Structure				Multi-joint Type
Degree of Freedom				6 Axes
Operation Method				AC Servo Motor
Max. Operation Range				
Basic Axis	S	Swivel	rad (°)	±2.97 (±170)
	H	For/Backward		+2.92 ~ -0.96 (+167 ~ -55)
	V	Up/Downward		+3.49 ~ -1.17 (+200 ~ -67)
Wrist Axis	R2	Rotation 2		±3.32 (±190)
	B	Bending		±2.18 (±125)
	R1	Rotation 1		±6.28 (±360)
Max. Operation Speed				
Basic Axis	S	Swivel	rad/s (°/s)	8.38 (480)
	H	For/Backward		8.03 (460)
	V	Up/Downward		9.08 (520)
Wrist Axis	R2	Rotation 2		9.60 (550)
	B	Bending		9.60 (550)
	R1	Rotation 1		17.45 (1,000)
Allowable Torque for the Wrist Axis	R2	Rotation 2	N.m (Kgf.m)	8.8 (0.90)
	B	Bending		8.8 (0.90)
	R1	Rotation 1		4.9 (0.50)
Degree of Repeatability			mm	±0.02
Ambient Temperature			°C	0 ~ 40 (273 ~ 313 K)
Weight			kg	22
Motion range cross-section			m^2	0.62
Installation Method				Floor / Ceiling / Wall
IP Grade				IP65

Handling

User IO

Pin No.	Description	
	Basic	Option
1	1 (User IO)	
2	2 (User IO)	
3	3 (User IO)	
4	4 (User IO)	
5	5 (User IO)	
6	6 (User IO)	
7	7 (User IO)	
8	8 (User IO)	
9	9 (User IO)	
10	10 (User IO)	
11	11 (User IO)	1A (Sol v/v)
12	12 (User IO)	1B (Sol v/v)
13	13 (User IO)	2A (Sol v/v)
14	14 (User IO)	2B (Sol v/v)
15	15 (User IO)	G (Sol v/v)
16	-	
17	-	
18	-	
19	-	
20	-	

High Speed Compact Handling Robot

HH4L

Handling Sealing Assembly

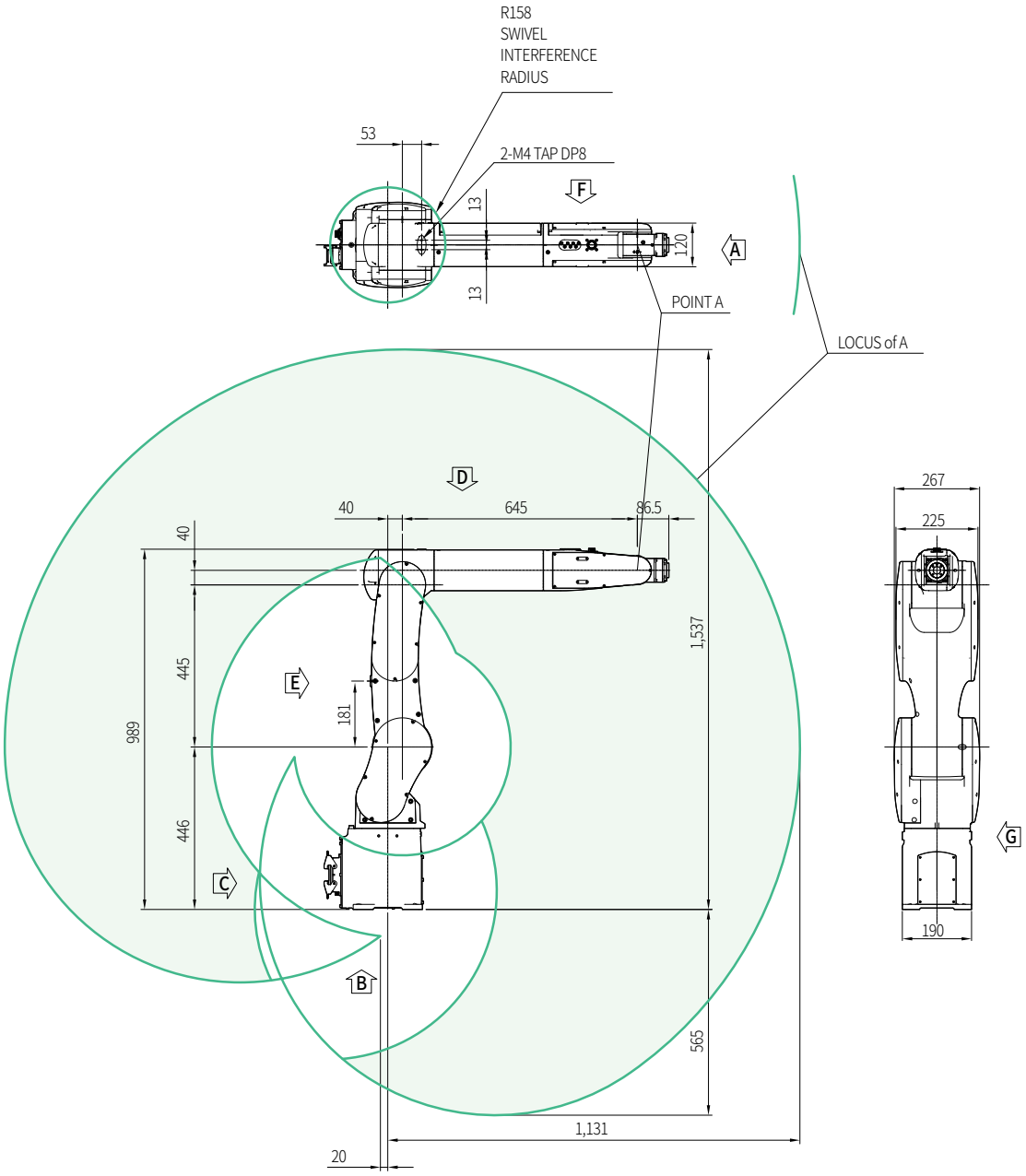
HH7 Features

Quick Speed

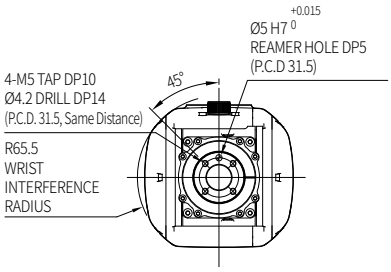
This robot is used when a lot of movement is required in a narrow and small space.

Wide Working Area

It's good to use when the object is light or long.

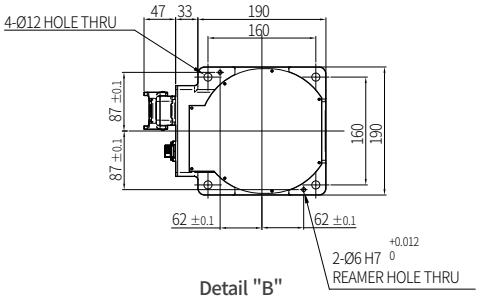


Wrist Mounting Section Detail Drawing



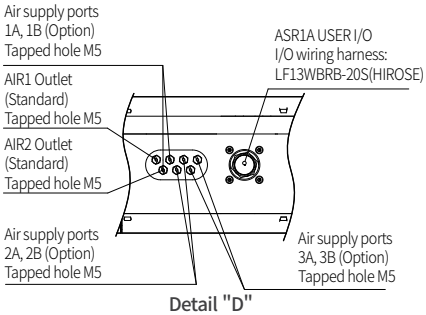
Detail "A"

Body Floor Mounting Dimensions



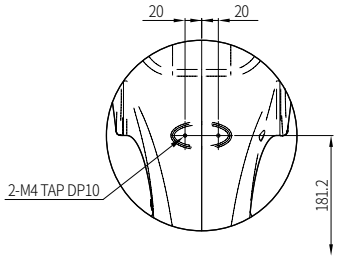
Detail "B"

Application Cable Connection Section



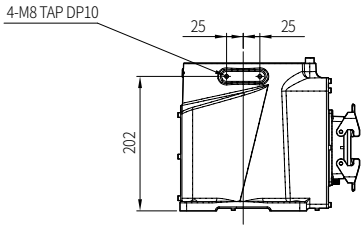
Detail "D"

Application Part Mounting Detail Drawing



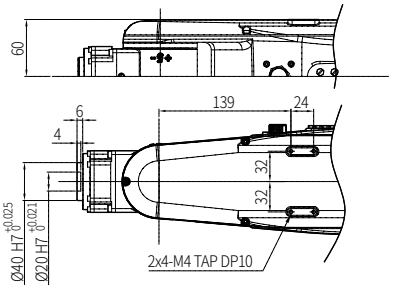
Detail "E"

Application Part Mounting Detail Drawing



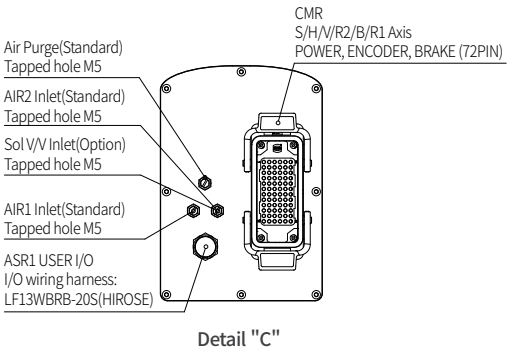
Detail "G"

Application Part Mounting Detail Drawing



Detail "F"

Application Cable Connection Section (Option)



Detail "C"

Specifications

Item				Specification
Model				HH4L
Payload			kg	4
Structure				Multi-joint Type
Degree of Freedom				6 Axes
Operation Method				AC Servo Motor
Max. Operation Range				
Basic Axis	S	Swivel	rad (°)	±2.97 (±170)
	H	For/Backward		+3.14 ~ -0.96 (+180 ~ -55)
	V	Up/Downward		+3.71 ~ -1.22 (+213 ~ -70)
Wrist Axis	R2	Rotation 2		±3.32 (±190)
	B	Bending		±2.36 (±135)
	R1	Rotation 1		±6.28 (±360)
Max. Operation Speed				
Basic Axis	S	Swivel	rad/s (°/s)	5.24 (300)
	H	For/Backward		4.01(230)
	V	Up/Downward		6.28(360)
Wrist Axis	R2	Rotation 2		9.60 (550)
	B	Bending		9.60 (550)
	R1	Rotation 1		17.45(1,000)
Allowable Torque for the Wrist Axis	R2	Rotation 2	N.m (Kgf.m)	6 (0.61)
	B	Bending		6 (0.61)
	R1	Rotation 1		2.9 (0.30)
Degree of Repeatability			mm	±0.03
Ambient Temperature			°C	0 ~ 40 (273 ~ 313 K)
Weight			kg	43
Motion range cross-section			m^2	3.45
Installation Method				Floor / Ceiling / Wall
IP Grade				IP65

Handling

User IO

Pin No.	Description	
	Basic	Option
1	1 (User IO)	
2	2 (User IO)	
3	3 (User IO)	
4	4 (User IO)	
5	5 (User IO)	
6	6 (User IO)	
7	7 (User IO)	
8	8 (User IO)	
9	9 (User IO)	
10	10 (User IO)	
11	11 (User IO)	
12	12 (User IO)	1A (Sol v/v)
13	13 (User IO)	1B (Sol v/v)
14	14 (User IO)	2A (Sol v/v)
15	15 (User IO)	2B (Sol v/v)
16	16 (User IO)	3A (Sol v/v)
17	17 (User IO)	3B (Sol v/v)
18	18 (User IO)	G (Sol v/v)
19	-	
20	-	

High Speed Compact Handling Robot

HH7

Handling Sealing Assembly

HH7 Features

High Functioning Small Robot

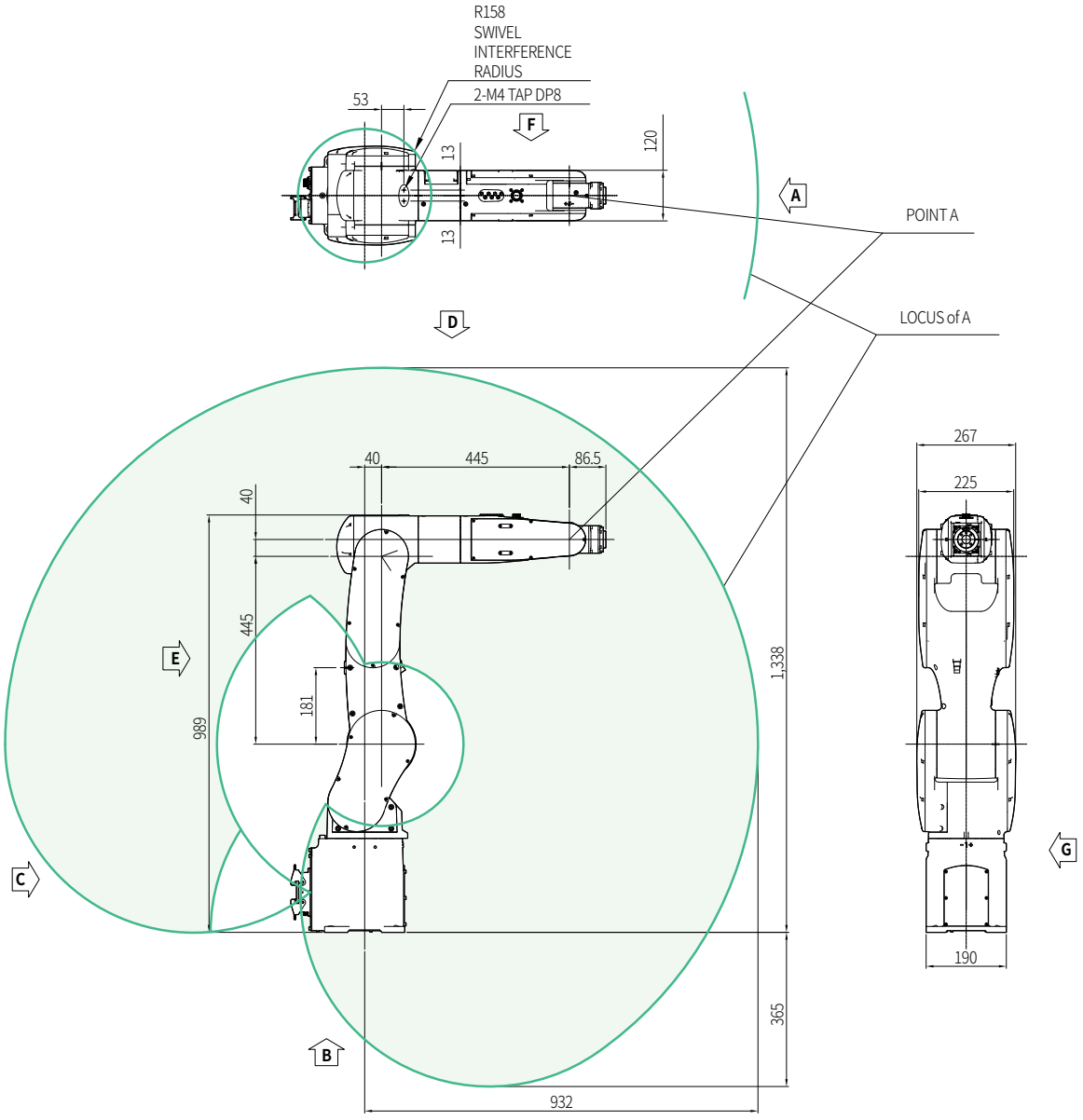
This robot is used when precision work is required such as in the semiconductor and food industry.

Excellent Precision Level

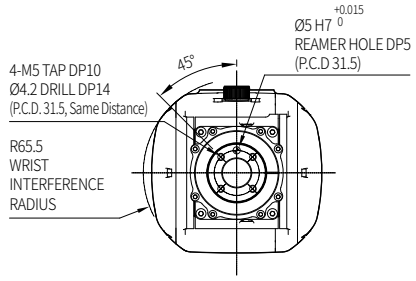
Its excellence can be experienced in work that requires focus and precision.

Wide Application

It can be used widely in various environments when products need to be moved quickly.

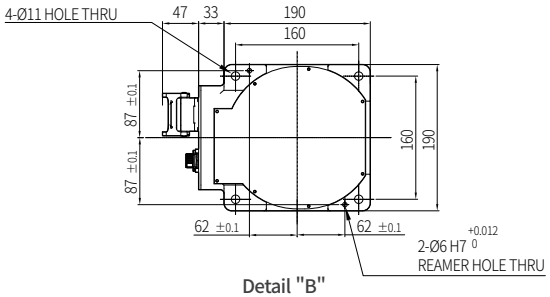


Wrist Mounting Section Detail Drawing



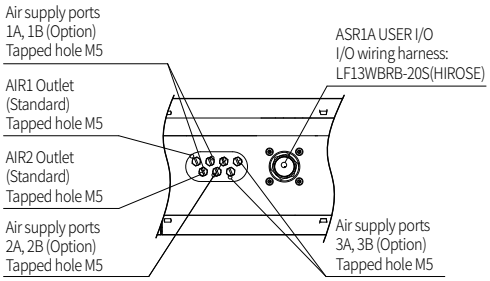
Detail "A"

Body Floor Mounting Dimensions



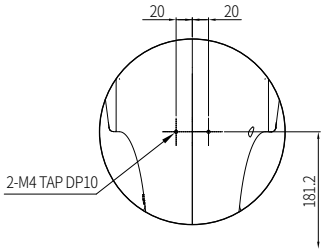
Detail "B"

Application Cable Connection Section



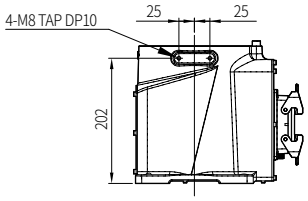
Detail "D"

Application Part Mounting Detail Drawing



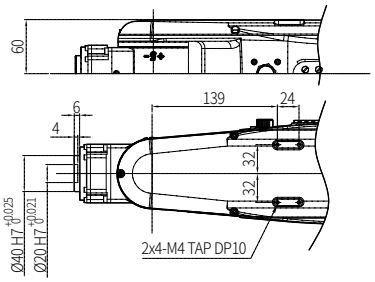
Detail "E"

Application Part Mounting Detail Drawing



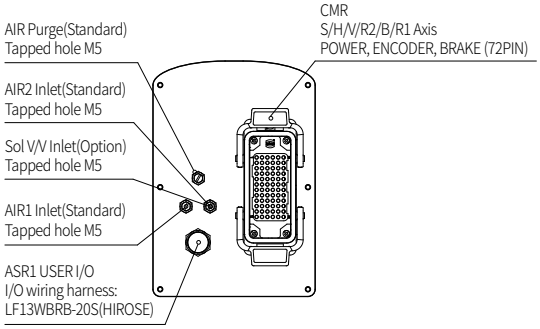
Detail "G"

Application Part Mounting Detail Drawing



Detail "F"

Application Cable Connection Section (Option)



Detail "C"

Specifications

Item				Specification
Model				HH7
Payload			kg	7
Structure				Multi-joint Type
Degree of Freedom				6 Axes
Operation Method				AC Servo Motor
Max. Operation Range				
Basic Axis	S	Swivel	rad (°)	±2.97 (±170)
	H	For/Backward		+3.14 ~ -0.96 (+180 ~ -55)
	V	Up/Downward		+3.71 ~ -1.22 (+213 ~ -70)
Wrist Axis	R2	Rotation 2		±3.32 (±190)
	B	Bending		±2.36 (±135)
	R1	Rotation 1		±6.28 (±360)
Max. Operation Speed				
Basic Axis	S	Swivel	rad/s (°/s)	6.54 (375)
	H	For/Backward		5.50 (315)
	V	Up/Downward		7.16 (410)
Wrist Axis	R2	Rotation 2		9.60 (550)
	B	Bending		9.60 (550)
	R1	Rotation 1		17.45 (1,000)
Allowable Torque for the Wrist Axis	R2	Rotation 2	N.m (Kgf.m)	17 (1.73)
	B	Bending		17 (1.73)
	R1	Rotation 1		0 (1.02)
Degree of Repeatability			mm	±0.03
Ambient Temperature			°C	0 ~ 40 (273 ~ 313 K)
Weight			kg	42
Motion range cross-section			m^2	1.98
Installation Method				Floor / Ceiling / Wall
IP Grade				IP65

Handling

User IO

Pin No.	Description	
	Basic	Option
1	1 (User IO)	
2	2 (User IO)	
3	3 (User IO)	
4	4 (User IO)	
5	5 (User IO)	
6	6 (User IO)	
7	7 (User IO)	
8	8 (User IO)	
9	9 (User IO)	
10	10 (User IO)	
11	11 (User IO)	
12	12 (User IO)	1A (Sol v/v)
13	13 (User IO)	1B (Sol v/v)
14	14 (User IO)	2A (Sol v/v)
15	15 (User IO)	2B (Sol v/v)
16	16 (User IO)	3A (Sol v/v)
17	17 (User IO)	3B (Sol v/v)
18	18 (User IO)	G (Sol v/v)
19	-	
20	-	

High Speed Compact Handling Robot

HH8

Handling Sealing Assembly

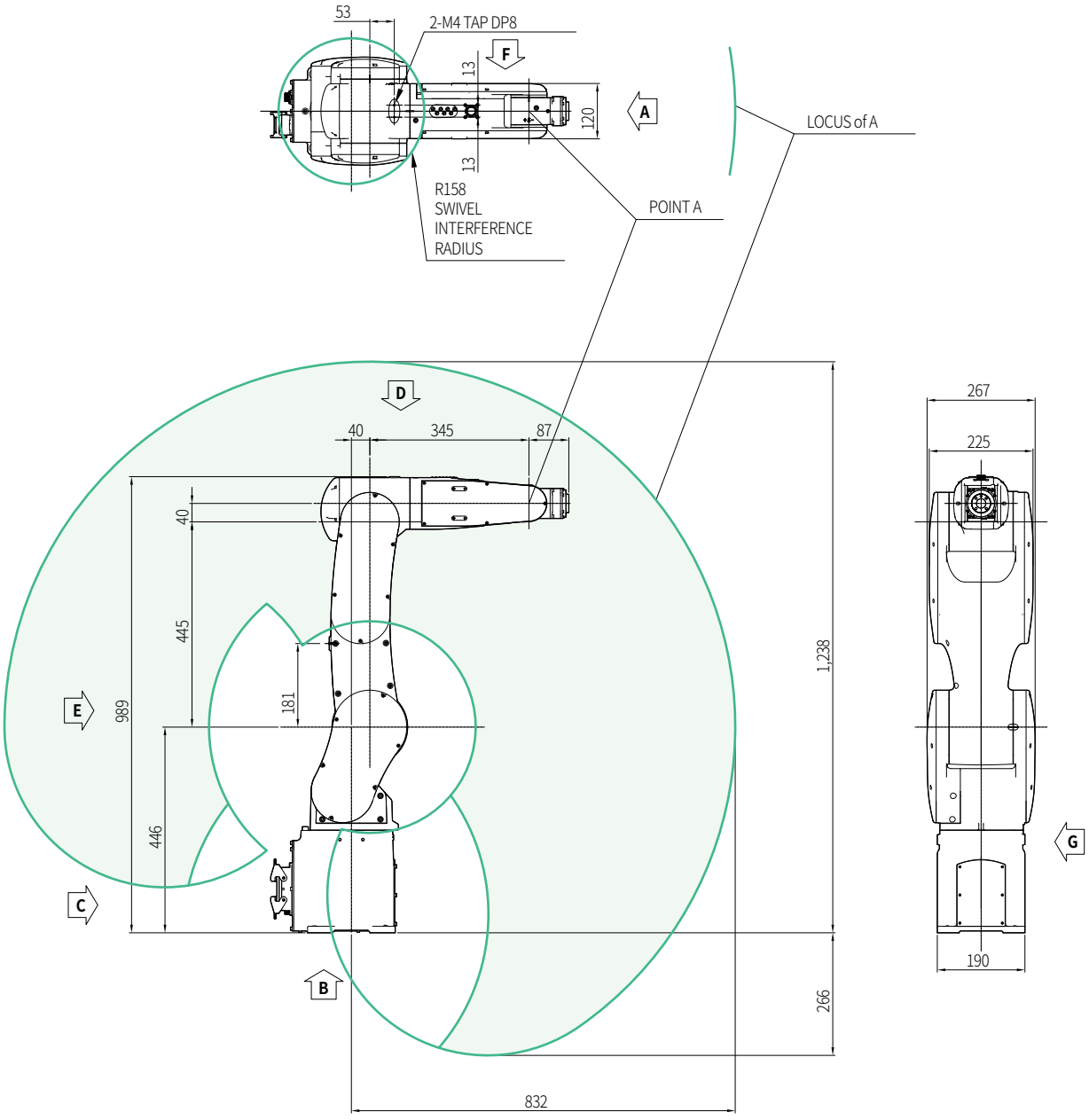
HH8 Features

Heavy-weight Possible

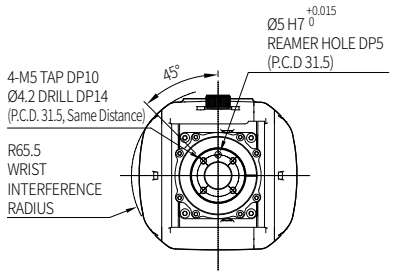
It's good to use for products that are heavier compared to their size.

Suitable for Industrial Use

It is useful when assembling and improves the quality of machinery and parts industries.

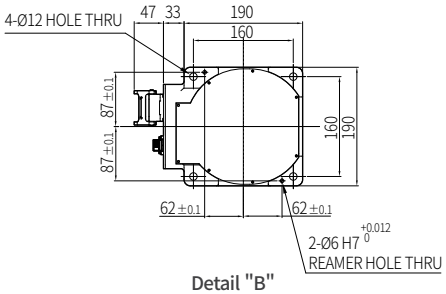


Wrist Mounting Section Detail Drawing



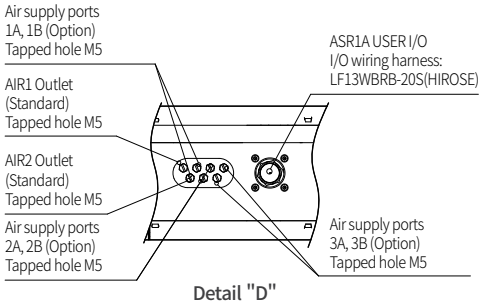
Detail "A"

Body Floor Mounting Dimensions



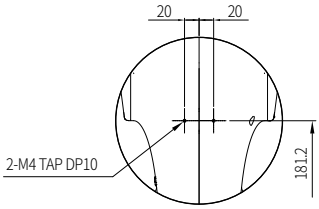
Detail "B"

Application Cable Connection Section



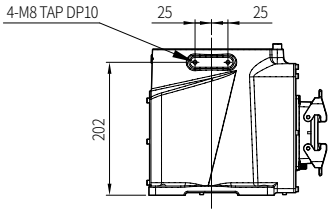
Detail "D"

Application Part Mounting Detail Drawing



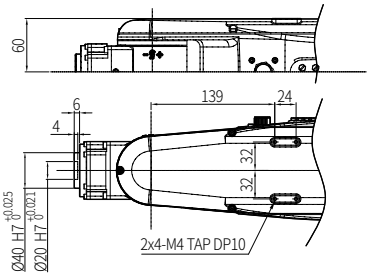
Detail "E"

Application Part Mounting Detail Drawing



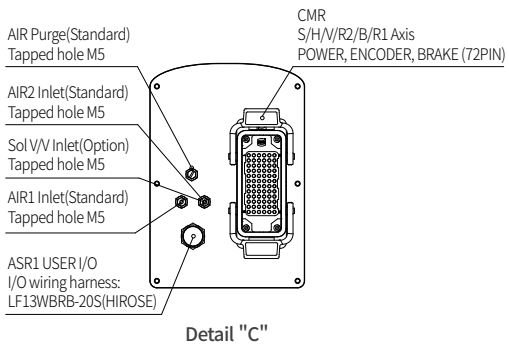
Detail "G"

Application Part Mounting Detail Drawing



Detail "F"

Application Cable Connection Section (Option)



Detail "C"

Specifications

Item				Specification
Model				HH8
Payload			kg	8
Structure				Multi-joint Type
Degree of Freedom				6 Axes
Operation Method				AC Servo Motor
Max. Operation Range				
Basic Axis	S	Swivel	rad (°)	±2.97 (±170)
	H	For/Backward		+1.74 ~ -0.96 (+180 ~ -55)
	V	Up/Downward		+3.71 ~ -1.15 (+213 ~ -66)
Wrist Axis	R2	Rotation 2		±3.32 (±190)
	B	Bending		±2.36 (±135)
	R1	Rotation 1		±6.28 (±360)
Max. Operation Speed				
Basic Axis	S	Swivel	rad/s (°/s)	7.94 (455)
	H	For/Backward		6.72 (385)
	V	Up/Downward		9.08 (520)
Wrist Axis	R2	Rotation 2		9.60 (550)
	B	Bending		9.60 (550)
	R1	Rotation 1		17.45 (1,000)
Allowable Torque for the Wrist Axis	R2	Rotation 2	N.m (Kgf.m)	17 (1.73)
	B	Bending		17 (1.73)
	R1	Rotation 1		10 (1.02)
Degree of Repeatability			mm	±0.02
Ambient Temperature			°C	0 ~ 40 (273 ~ 313 K)
Weight			kg	41
Motion range cross-section			m^2	1.46
Installation Method				Floor / Ceiling / Wall
IP Grade				IP65

Handling

User IO

Pin No.	Description	
	Basic	Option
1	1 (User IO)	
2	2 (User IO)	
3	3 (User IO)	
4	4 (User IO)	
5	5 (User IO)	
6	6 (User IO)	
7	7 (User IO)	
8	8 (User IO)	
9	9 (User IO)	
10	10 (User IO)	
11	11 (User IO)	
12	12 (User IO)	1A (Sol v/v)
13	13 (User IO)	1B (Sol v/v)
14	14 (User IO)	2A (Sol v/v)
15	15 (User IO)	2B (Sol v/v)
16	16 (User IO)	3A (Sol v/v)
17	17 (User IO)	3B (Sol v/v)
18	18 (User IO)	G (Sol v/v)
19	-	
20	-	

Controller

| Hi5a-S20 | Hi5a-S30 | Hi5a-T10 |

Controller Specifications

Item	Specification		
Model	Hi5a-S20	Hi5a-S30	Hi5a-T10
Operating Mode	Teaching & Playback	Teaching & Playback	Teaching & Playback
Interpolation	Point-to-Point, Linear, Circular	Point-to-Point, Linear, Circular	Point-to-Point, Linear, Circular
Number of Axes	Max. 8 axes simultaneously (standard 6 axes)	Max. 16 axes simultaneously (standard 6 axes)	Max. 8 axes simultaneously (standard 6 axes)
Number of Steps	4MB (max. 21,000 steps)	4MB (max. 21,000 steps)	4MB (max. 21,000 steps)
External Program Selection	Binary 255 / Discrete 8	Binary 255 / Discrete 8	Binary 255 / Discrete 8
Position Detector	Serial Absolute Encoder	Serial Absolute Encoder	Serial Absolute Encoder
Program Back-up	USB Memory	USB Memory	USB Memory
Servo Drive System	Full Digital Servo	Full Digital Servo	Full Digital Servo
Conveyor Pulse Counter	Differential & Open Collector Type	Differential & Open Collector Type	Differential & Open Collector Type
User Interface	2×Ethernet (100 Base-T)	2×Ethernet (100 Base-T)	2×Ethernet (100 Base-T)
	2×RS232C/RS422	2×RS232C/RS422	2×RS232C/RS422
	1×USB (for backup, version-up)	1×USB (for backup, version-up)	1×USB (for backup, version-up)
	2×CAN (1 option)	2×CAN (1 option)	2×CAN (1 option)
	1×SD Card	1×SD Card	1×SD Card
Digital Input/Output	Max. 80 / 80	Max. 256 / 256	Max. 40 / 40 (default 8 / 8)
Analog Input/Output	8 / 8 (option)	8 / 8(option)	8 / 8 (option)
Fieldbus(option)	PROFINET IO-Controller / IO-Device	PROFINET IO-Controller / IO-Device	PROFINET IO-Controller / IO-Device
	EtherNet/IP Scanner / Adapter	EtherNet/IP Scanner / Adapter	EtherNet/IP Scanner / Adapter
	DeviceNet Master / Slave	DeviceNet Master / Slave	DeviceNet Master / Slave
	PROFIBUS-DP Master / Slave	PROFIBUS-DP Master / Slave	PROFIBUS-DP Master / Slave
	CC-Link Slave(V1.10, V2.0)	CC-Link Slave(V1.10, V2.0)	CC-Link Slave(V1.10, V2.0)
	MODBUS(Serial)	MODBUS(Serial)	MODBUS(Serial)
Rated Supply Voltage	3Φ AC220V±10%, 50/60Hz	3Φ AC220V±10%, 50/60Hz	3Φ AC220V±10%, 50/60Hz 1Φ AC220V±10%, 50/60Hz
Max. Rated Power	4.4kVA	4.4kVA	1.5kVA
Size (W×D×H)	550×600×300mm	700×900×630mm	490×430×260mm
Environment	Ambient Temperature：0°C~45°C Relative Humidity：20~95% Non-condensing	Ambient Temperature：0°C~45°C Relative Humidity：20~95% Non-condensing	Ambient Temperature：0°C~45°C Relative Humidity：20~95% Non-condensing
IP Grade	IP54	IP54	IP20

Teaching Pendant Specifications

Item	Specification
Model	TP520
Operating System	Windows CE
Display	7” Color TFT-LCD/ Touch Panel
Operating Mode	Menu Driven and Code Input

Safety Precautions

1. Conditions of use

1. The ambient temperature should be within the range of 0°C ~ 45°C.
2. The ambient humidity should be 20 ~ 85%RH with no condensation.
3. There should be only a little dirt, oil, moisture, etc.
4. No flammable, corrosive liquid, and gas should be present.
5. It should not receive any large shocks and vibrations.
6. There should be no sources of large electrical noise nearby.
7. If the robot is not installed immediately, store it in a dry place with an ambient temperature of -15°C to 40°C.

2. Installation

2.1. Safety protection fence

Since there is a risk of collision between the robot and the operator during robot operation, install a fence so that the operator does not come close to the robot.

An accident may occur due to accidental entry by operators or others. For inspection of robots or welding fixtures, tip dressing or tip changing, configure the robot so that it stops when the fence is opened and the facility is approached during robot operation.

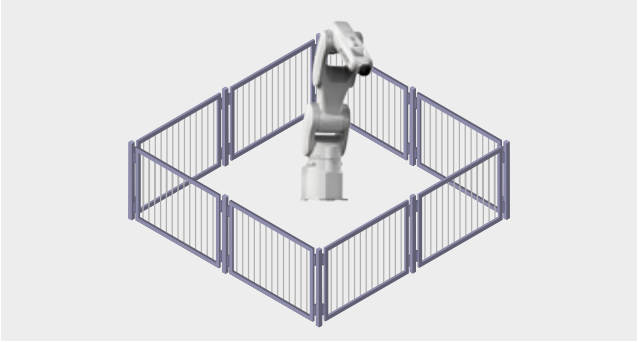


Figure 1.1 Recommended fence size and door size (slot type doorway)

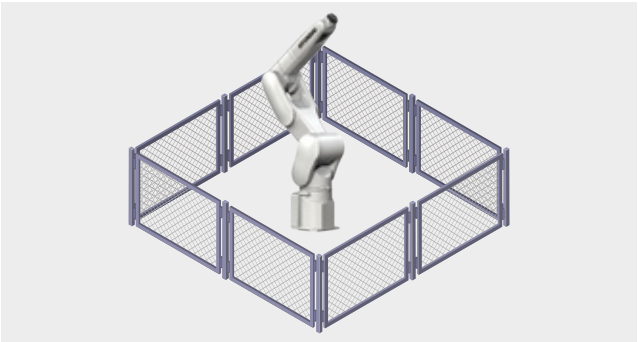


Figure 1.2 Recommended fence size and doorway size (square doorway)

1. The fence should cover the robot's motion area, and it is necessary to secure enough space so that it does not interfere with the operator's teaching and maintenance work. It should be rigid so that it does not move easily and be made in a structure so that people cannot easily cross over and enter.
2. In principle, the fence must be installed as a fixed type. Use fences that do not have any dangerous parts such as irregularities or sharp parts.
3. Install an entrance door to allow entry inside the fence, and a safety plug must be attached to the entrance door to prevent the door from opening unless the plug is removed. Also, when the safety plug is unplugged or the fence is opened, wire the robot so that the robot's operation and motors turn off.
4. If you want to operate the robot with the safety plug unplugged, wire the robot so that it runs at low speed.
5. Install an emergency stop button for the robot where the operator can quickly press it.
6. If a fence won't be installed, install photoelectric switches and mat switches in the entire area within the robot's motion range to replace the safety plug so that the robot automatically stops when a person enters.
7. Make sure that the robot's motion area (hazardous area) can be identified such as by painting the floor.

2.2. Robot and surrounding device placement

Be sure to arrange the robot and surrounding devices in the following way.

1. When connecting the primary power of a controller or surrounding device, check whether the supply side power is off before starting the work. There is a risk of electric shock since high voltage such as 220 V and 440 V is used as the primary power source.
2. Attach the [Do not enter while operating] label at the entrance of the fence and inform the operator.
3. Arrange the controller, interlock panel, and other operation panels so that they can be operated from outside the fence.
4. When installing the operation stand, attach an emergency stop button to the operation stand as well. Wherever the robot is operated, it should be possible to stop operation in an emergency.
5. Take care that the wiring and piping of the body of the robot, controller, interlock panel, and timer do not get caught by the operator's foot or gets stepped on directly by the forklift. There is a risk of electric shock to the operator or an accident of the wiring disconnecting may occur.
6. Place the controller, interlock panel, and operation stand where the movement of the robot body can be seen adequately. There

is a risk of a major accident if the robot is operated when there is an error in the robot or if the operator is working on it and it's in an area where the robot's motion cannot be seen.

7. If the required work area of the robot is narrower than the workable area of the robot, limit the operation area of the robot. It can be limited by a soft limit or mechanical stopper. Even if movement outside the restricted area occurs due to an abnormal operation such as an incorrect operation of the robot, the robot automatically stops in advance by the motion area limitation function. (Refer to the main unit maintenance manual.)
8. During welding, a spatter may fall on the operator or nearby and cause burns or fire. Install a shield or cover in the range where the movement of the robot's body is sufficiently visible.
9. Install a conspicuous device so that the automatic and manual operation status of the robot can be recognized from a distance. When starting automatic operation, a buzzer or alarm is useful.
10. Make sure that there are no protrusions on the devices around the robot. If necessary, place a cover over it. There is a risk that an accident may occur from contact with the operator, and there is a risk of a large accident that may occur if the operator is surprised by the sudden movement of the robot and trips.
11. Do not design a system that uses your hands inside the fence to carry in or take out the work object. There is a risk of crushing or cutting accidents.

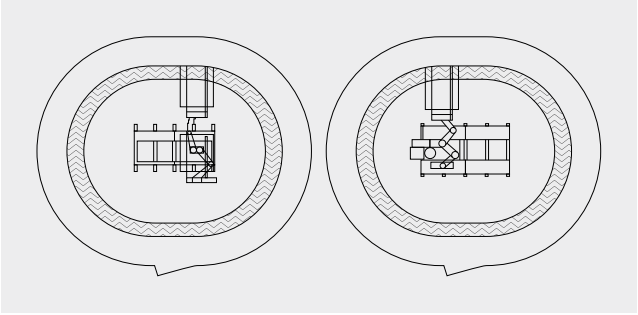


Figure 1.3 Placement of operator and surrounding devices around an industrial robot

2.3. Robot Installation

Be sure to arrange the robot and surrounding devices in the following way.

In order to fully perform the functions of the robot, install it according to the preliminary review and planned foundation and layout. If the robot's installation condition is bad, errors may occur in the relative position between the robot and the work object during operation, vibration may be caused to deteriorate the work quality of the robot, the life span of the robot may be shortened and dangerous situations may occur. Therefore, pay attention to the following when installing the robot.

General Safety Items

1. In order to protect operators, the system must be perfectly designed and installed in accordance with the safety requirements stipulated in the laws and standards of the country in which the robot is installed.
2. Operators who use robots must familiarize themselves with the matters described in the application and auxiliary manuals so that they can operate and handle industrial robots skillfully.
3. The operator installing the robot must be able to apply safety instructions during installation work if there is a problem.
4. The system supplier must ensure that all circuits using safety functions perform their functions reliably.
5. The main power supply to the robot must be installed so that it can be cut off outside the robot's work area.
6. The system supplier must ensure that all circuits using the emergency stop function perform their functions in a safe manner.
7. The emergency stop button should be located in a place where the operator can easily access in case the robot needs to be stopped quickly.

Technical Safety Items

1. Consider the dimensions of the body and the operating range so that there is no interference with surrounding devices.
2. Avoid installation in places exposed to direct sunlight, humid places, locations with greases or chemicals, or where the air contains a lot of metal powders or explosive gases.
3. Install it in a place with an ambient temperature of 0 to 45 °C.
4. Secure enough space for easy disassembly and inspection.
5. Install a safety fence and prevent people from entering the robot's motion range.
6. Make sure there are no obstacles in the robot motion area.
7. When installing in a place exposed to direct sunlight or near a heating element, take countermeasures in consideration of the thermodynamic state of the controller.
8. Take extra measures when installing in a place where there is a lot of dust, such as metal powder, in the air.
9. Install the robot where there is no welding current flow. In other words, insulate between the spot gun and the robot wrist.
10. Because grounding is important in terms of preventing malfunction from noise and electric shock, install in the following way.
    ① Install a dedicated grounding terminal and use type 3 grounding or above.(If the input voltage of the robot controller is 400 V or higher, use a special type 3 grounding or higher.)
    ② Connect the ground wire to the ground bus bar inside the control panel.

③ If the robot body is directly grounded to the floor by an anchor, the controller side and the robot body side become two grounding points, resulting in a closed circuit. Conversely, there is a risk of malfunction due to noise.
In this case, connect the ground wire to the base of the robot body and not the controller side. Also, if there is vibration when the robot is stopped, there is a high possibility of incomplete grounding or a closed circuit, so check the grounding again.

④ If a gun built-in the transformer is used, there is a risk of dropping because the primary power cable is directly connected to the spot gun. In this case, to protect the control panel and prevent electric shock, connect the ground wire directly to the base of the robot body and do not connect it to the controller.

3. Safe work when operating robot

To prevent safety accidents, be sure to follow the safety work procedures. Do not change or ignore the safety device or circuit under any circumstances, and be careful of electric shock accidents. In automatic mode, all normal work must be done outside the safety fence.
Before working, make sure that there are no people in the working area of the robot.

3.1. Safety measures when operating robot

Safety is very important when operating the robot, so practice the following measures.

1. Operators working the robot, operators who are likely to work the robot, and supervisors must take a prescribed training. Anyone other than those designated as persons who are fully aware of the safety and functions of the robot should not operate the robot.
2. Hard hat, safety glasses, and safety shoes must be worn.
3. Two people must work. One person does the teaching work and the other person monitors by the control panel. One person should always be prepared to press the emergency stop switch, and the other person should work quickly with sufficient caution in the motion area. Also, check the evacuation route before starting work.
4. Turn on the power after checking if there are any operators in the robot motion area.
5. Teaching work is in principle done outside the robot motion range. However, when you stop the equipment and work within the motion range, enter with a key switch or safety plug that changes to automatic operation. It's necessary to prevent the other operator from changing to automatic operation by mistake. In addition, in case of an emergency, pay special attention to the direction of the operation in preparation for malfunctions and bad conditions of the robot.
6. The supervisor needs to observe the following matters.
   ① Stay where you can see the entire robot and focus on the task of supervision.
   ② When there is a problem, immediately press the emergency stop button.
   ③ Make sure no one is within the range of motion except those who are engaged in the work.
7. In manual operation, the maximum speed is limited to 250 mm/sec.
8. When teaching, work with a sign that says [Teaching in Progress].
9. When entering the safety fence, the operator must pull out the safety plug and bring it in.
10. Do not use equipment that may cause noise in the teaching work area or around it.
11. While looking at the teaching point, do not operate the teach pendant's robot operation button only by the sense of your hand but check with your eyes.
12. This is a maintenance part to be prepared when purchasing multiple units.
13. When teaching, work while checking the feet sufficiently.
    In particular, when teaching at high altitudes (over 2m), secure a safe area where you can step before working.
14. Take the following actions in case an abnormality occurs.
    ① When an abnormal operation is found, immediately press the emergency stop switch.
    ② When checking for abnormalities due to an emergency stop, be sure to check the stop status of related equipment.
    ③ If the robot automatically stops due to an abnormal power supply, check that the robot has stopped completely, investigate the cause, and take countermeasures.
    ④ If the emergency stop device does not perform its function, immediately cut off the main power supply and investigate the cause and take measures.
    ⑤ Investigation of the cause of the above should not be done by anyone else than the designated person. Re-start after an emergency stop is done in order once measures are taken after the cause of the abnormality is clearly identified.
15. Prepare appropriate work regulations according to the installation location and work details regarding the robot operation method, control method and measures in case of abnormality.
16. Cautions when robot is stopped
    You must avoid recklessly approaching the robot, thinking that the robot is stopped. There have been many cases of disaster when a person thought the robot was stopped and approached it but the robot moved suddenly. The following cases may be occurring when the robot is stopped.

Table 3-1 Robot's status

No.	Robot's Status	Operation Source	Entrance Access
1	Temporary stop (minor abnormality, pause switch)	ON	×
2	Emergency stop (significant abnormality, emergency stop switch, safety gate)	OFF	●
3	Waiting for input signal from surrounding device (START INTERLOCK)	ON	×
4	Completing playback	ON	×
5	Waiting	ON	×

Even when access is possible, do not neglect to pay attention to unexpected movement. In any case, absolutely avoid approaching without preparation for emergency situations.

- When opening the gate during a temporary stop for minor abnormality measure (nozzle contact and welding detection, arc abnormality, etc.), take the same measures as doing a teaching work and enter.

17. After completing the robot operation, clean the inside of the safety fence and check that there are no tools, oil, or foreign substances left. If the work area becomes dirty with oil or tools are laying around, it may cause an accident such as a fall. Always stay clean and organized.

4. Inspection

It describes the periodic inspection and disassembly adjustment necessary to maintain the robot's performance for a long time.

4.1. Inspection items and cycle

Inspection is essential to maintain high performances in long-term operations of the robot. There are daily and periodic inspections and the basic inspection cycle is indicated in [Table 4-1], so the person in charge of inspection must perform it according to the inspection cycle. Overhaul every 35,000 operating hours.

The inspection cycle was reviewed for spot welding. When used for high-precision work such as handling work, it is recommended to conduct inspections at about 1/2 of the time in the [Table 4-1] cycle. If it is difficult to understand how to inspect and adjust, contact our A/S center (Customer Support Division).

Table 4-1 Inspection plan

Daily Inspection	Daily	Main body, motor, reducer
Periodic Inspection	3 months	Wiring, bolt, reducer
	1 year	Limited switch/dog, brake

- If the robot is being used in adverse conditions (e.g., spot welding, grinding, etc.), take the inspection cycle shorter to ensure the performance of the robot system.
- Inspect all visible cables and replace damaged cables.
- Make sure that the mechanical bumper is not deformed or damaged. If the bumper is damaged or the dog is bent, replace it immediately.
- Check the tightening torque of the main bolts.
- To check the power transmission device (motor, reducer, etc.) for abnormalities, check for abnormal sounds in the automatic or teaching mode.

Table 4-2 Inspection items and cycle

No	Inspection Cycle			Inspection Item	Inspection Method	Standard	Remarks
	Daily	3 months	1 year				
Common to robot body and each axis							
1	●			Body cleaning	Visual check for trash, etc.		
2		●		Wiring inspection	Visual check for cable damage Cable fixing bracket fastening bolt Visual check for paint marking Visual check for cable cover damage		
3		●		Main bolts	Visual check for paint marking		
4	●			Motor	Check for abnormal heating Check for noise		Motor
5			●	Brake	Check operation with brake release switch On and Off Note) When the brake release switch is ON, the arm or the motion axis falls, so turn it off within 1 second when checking.	When the brake release switch is OFF, the arm or end effect does not fall.	Brake
S, H, V axis							
6	●			Reducer	Check for noise Check for vibration		
R2, B, R1 axis							
7		●		Reducer	Check for noise Check for vibration		
8		●		End effect fastening bolt	Visual check for paint marking		
9		●		Gap	Rotate each axis in the forward/reverse direction to check the presence or absence of gaps.	You cannot feel gaps with your hands.	

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