HAN'S ROBOT

HAN'S ROBOT

Collaborative Robot Elfin Series

Hardware Installation

(E03/E05/E10)
V2.0.0

Introduction

How to Use This Manual

This manual is intended for operators of Elfin robots, who should have some electrical and programming knowledge. The manual will provide instructions for Elfin operators from the following ways:

- ☑Safety: The operator should keep all safety instructions in mind.
- ☑Mechanical Installation: The operator should follow the instructions when installing the robot.
- ☐Electrical interface: Open ports of Elfin are introduced for the convenience of secondary development.
- ☐Software Control: It can guide the operator to install software and run the robot.
- ☐Security Configuration: It introduces the basic safety settings.

Technical Support

Shenzhen Han's Robot Co., Ltd will provide you with long-term technical services. If you have any technical problems or other needs during using our robot, you are welcome to visit our company website: www.hansrobot.com, or directly contact our technical engineers.

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Chapter 1 Product Introduction

1.1 Introduction to Collaborative Robot Elfin Series

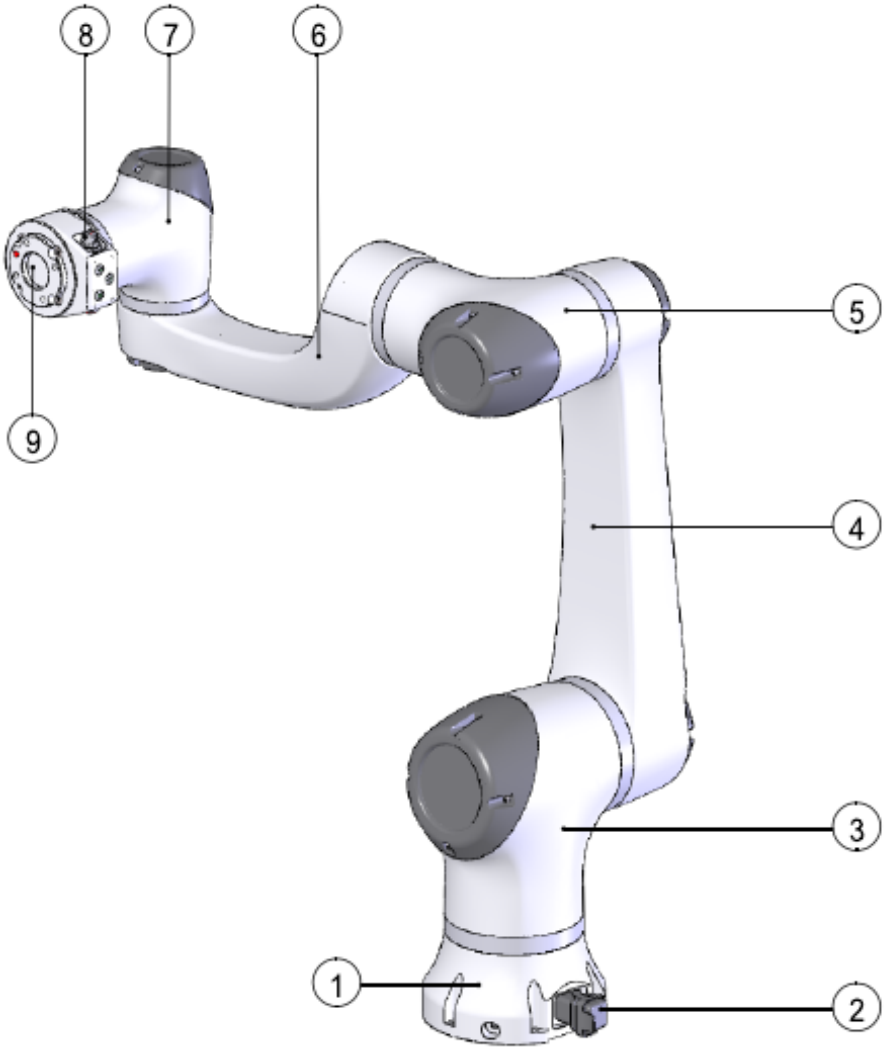
Elfin robot is a new type of human-machine collaborative six-axis robot. Its overall design is lightweight, modular, compact and beautiful, and it can flexibly accommodate to all kinds of complicated and varying industrial production environments.

1.2 List of Parts

Robot	Robot body	×1
	End connection line	×1
Electric control box	Electric control box	×1
	Power cable line	×1
	Connecting cable line	×1
Teach pendant	Teach pendant	×1
Instructions	Stored in USB flash disk	×1

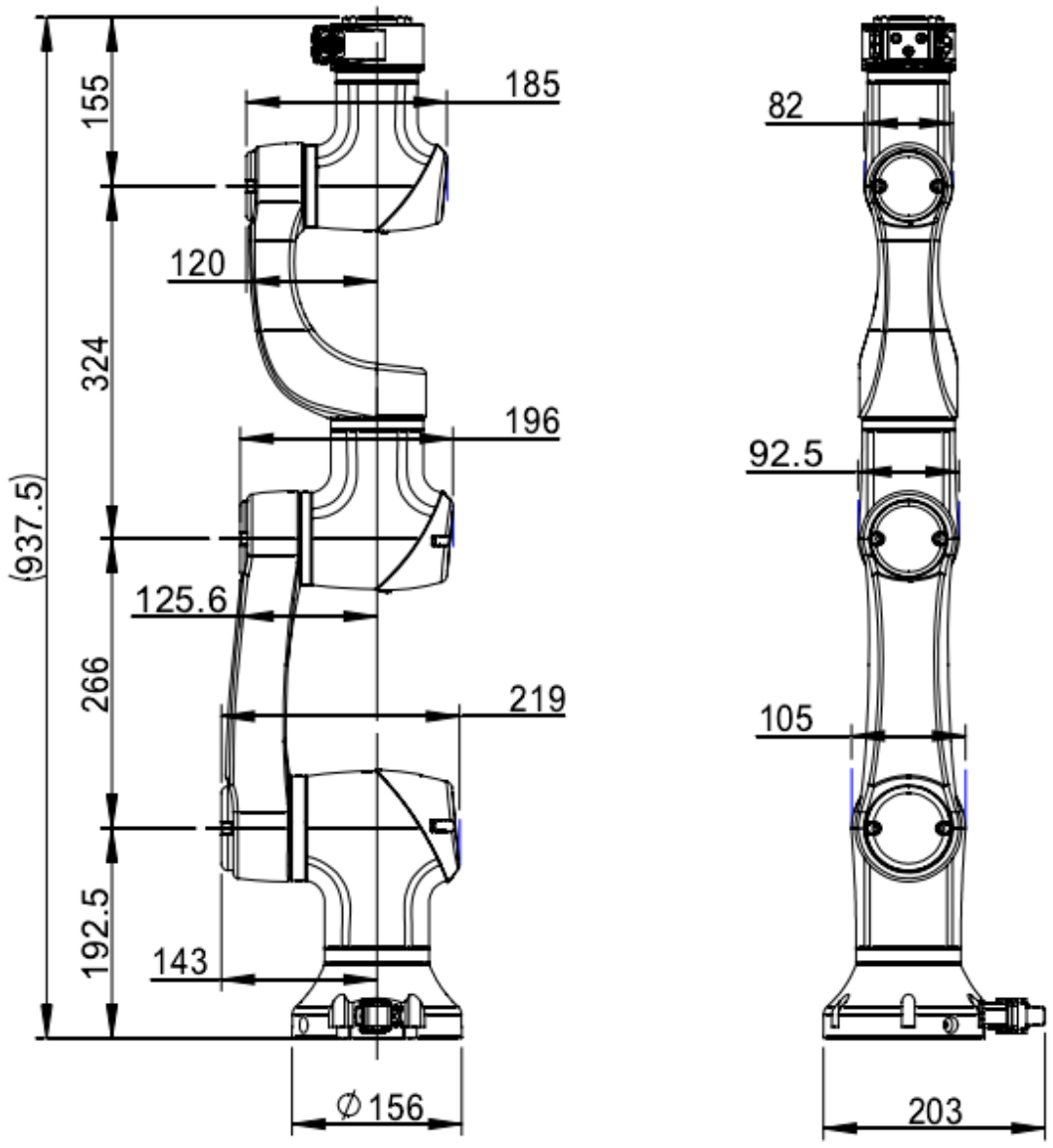
1.3 Robot Body

1.3.1 Name of Each Part

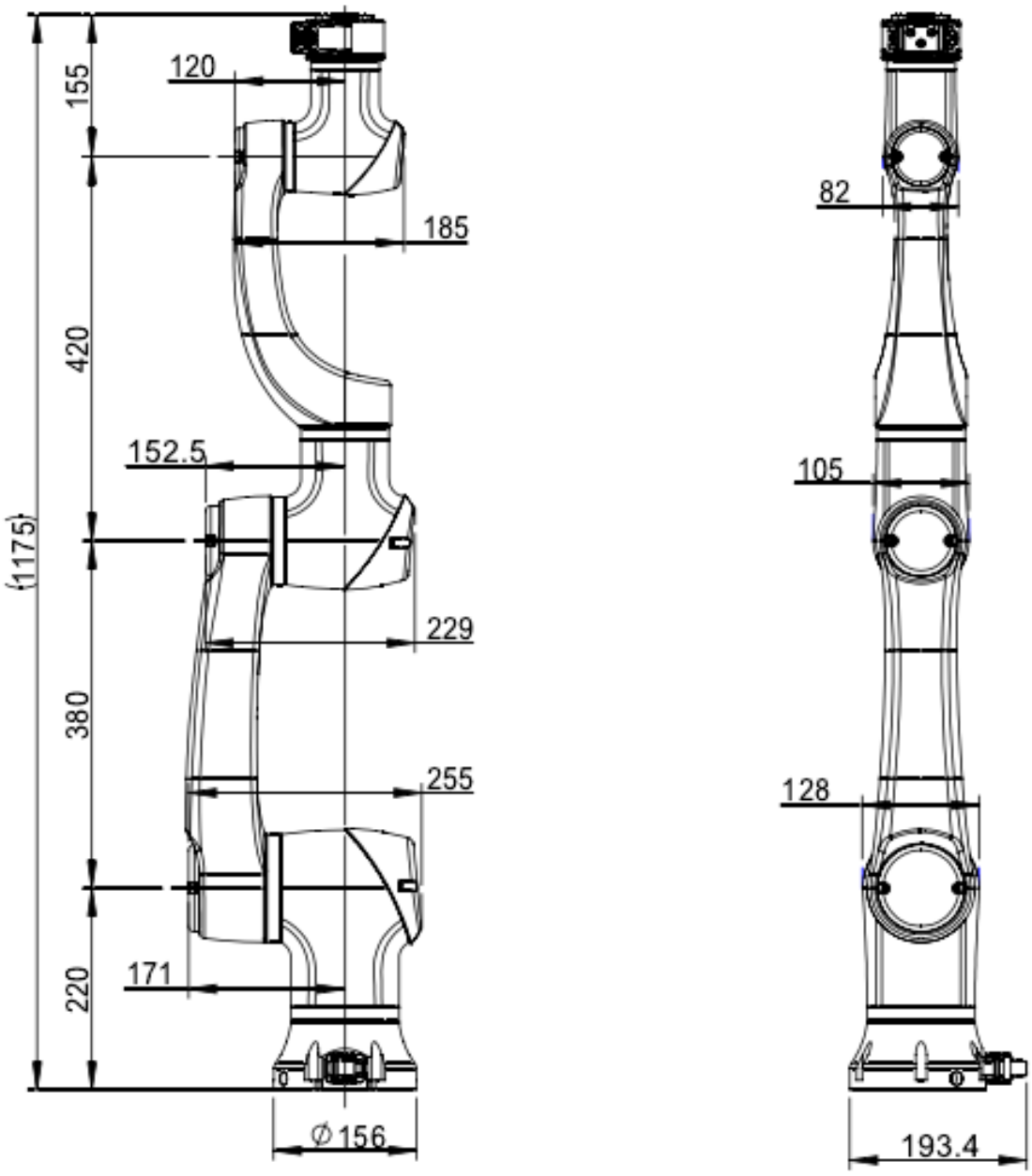


1. Base
2. Communication and power cable
3. Jl-J2 module
4. Lower arm
5. J3-J4 module
6. Upper arm
7. J5-J6 module
8. Tool IO
9. Tool flange

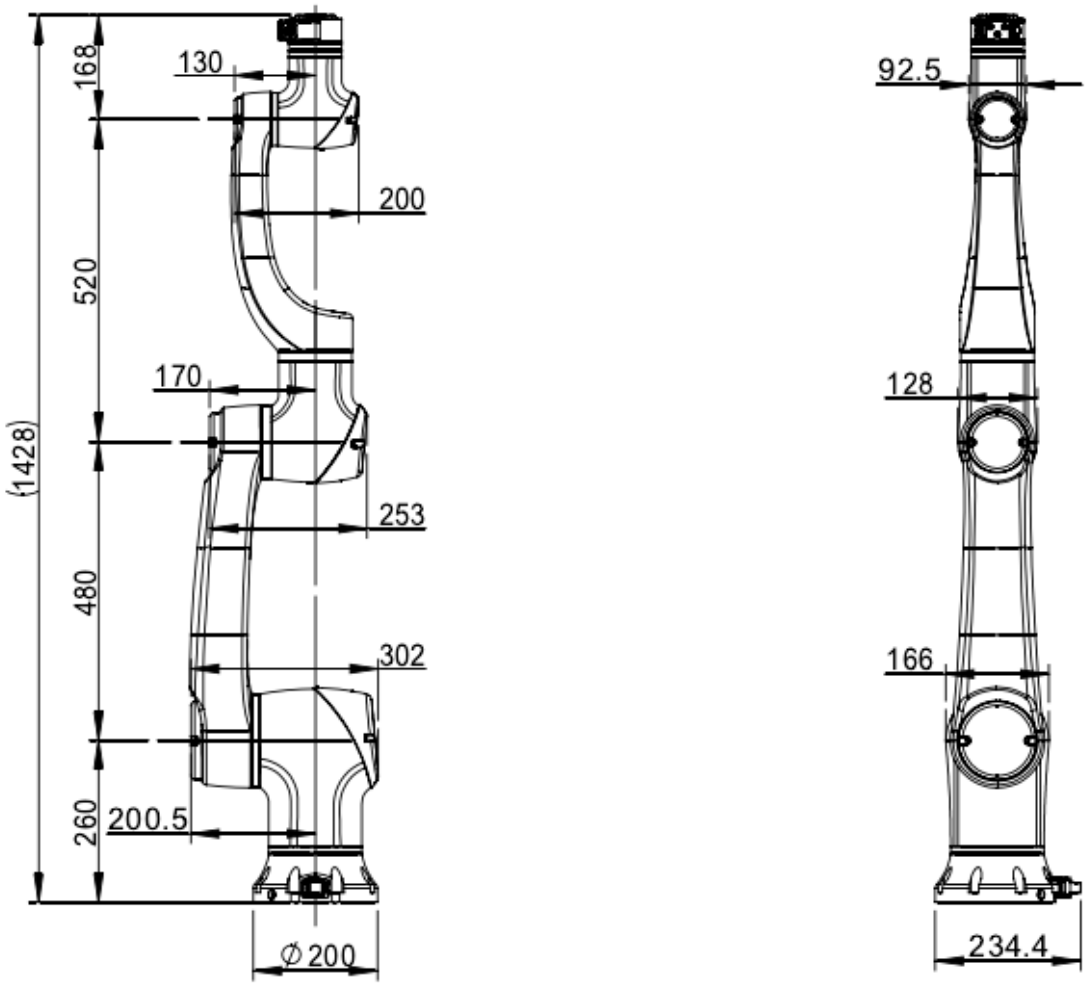
1.3.2 Size and Specification（E03）



1.3.3 Size and Specification（E05）



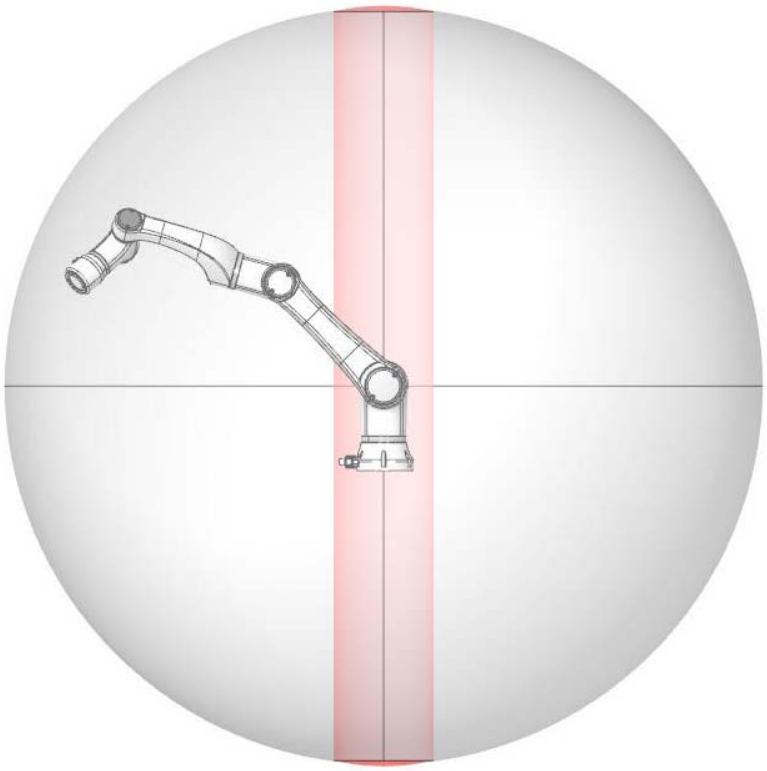
1.3.4 Size and Specification（E10）



1.3.5 Robot Working Space

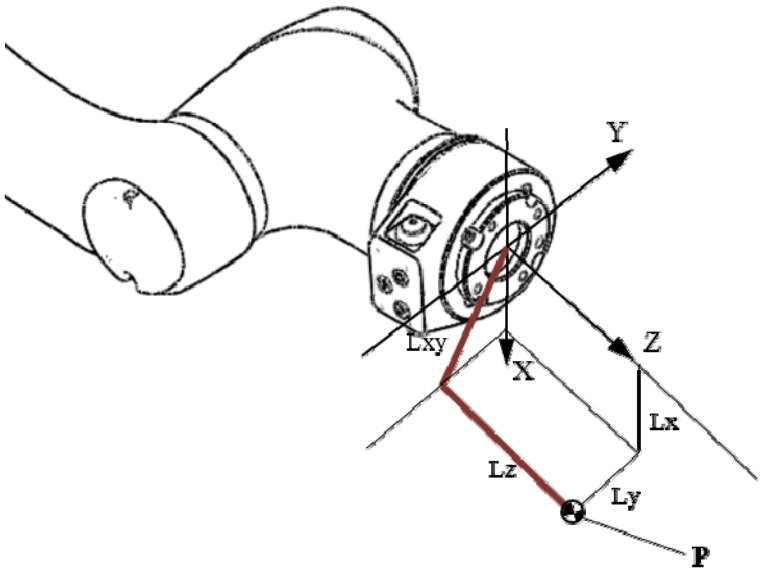
The working space of robot refers to the area within **the specified range** around the joint of robot base (as shown in the following table). When selecting the location to install robot, considerations should be given to the cylinder space above and below the robot. Please try to keep the tool away from the cylindrical space as much as possible, otherwise it will cause the situation where the tool moves slowly and joints move too fast, which leads to the low efficiency of robot and difficult risk assessment.

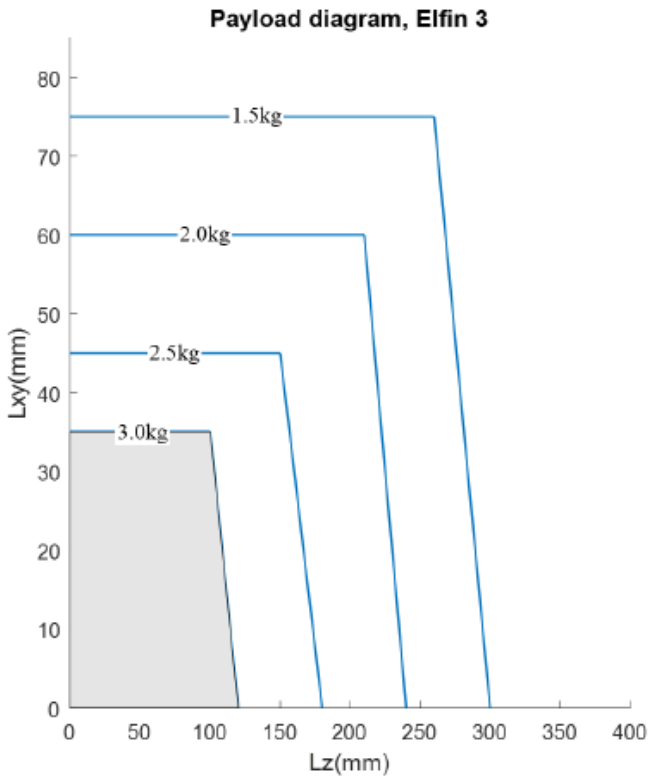
Type	E03	E05	E10
Range	590mm	800mm	1000mm

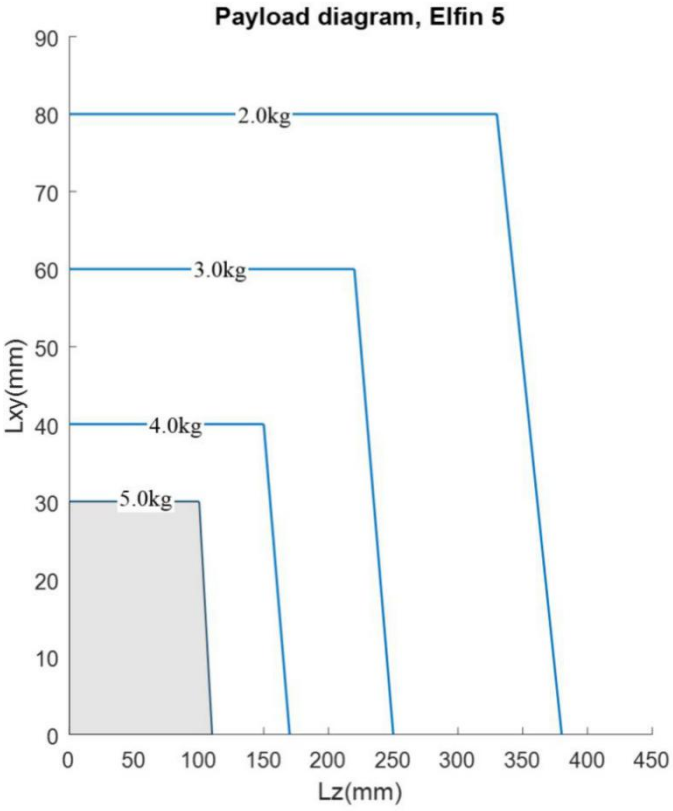


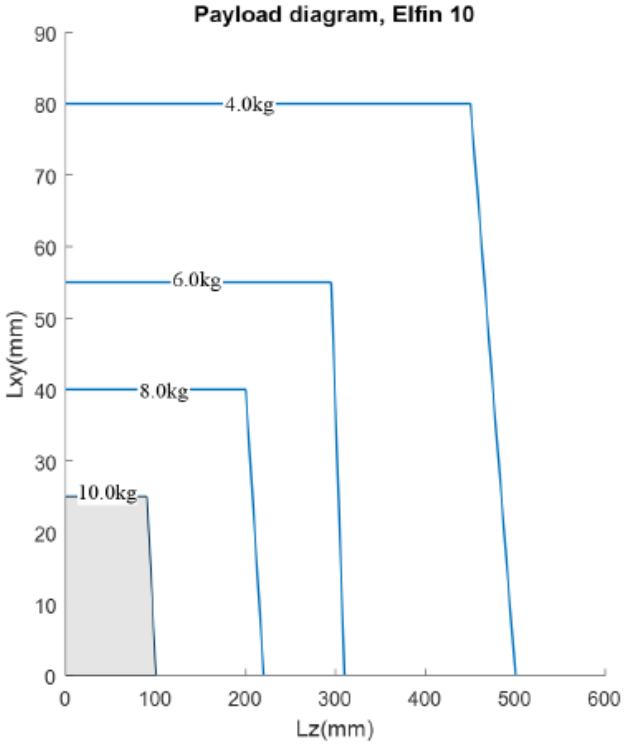
1.3.6 Tool Payload Range

Due to different distances between load center at the end of robot and the center of installed flange, the allowable maximum payload of robot will change accordingly. The relationship between the centroid distance and allowable payload is shown as below:



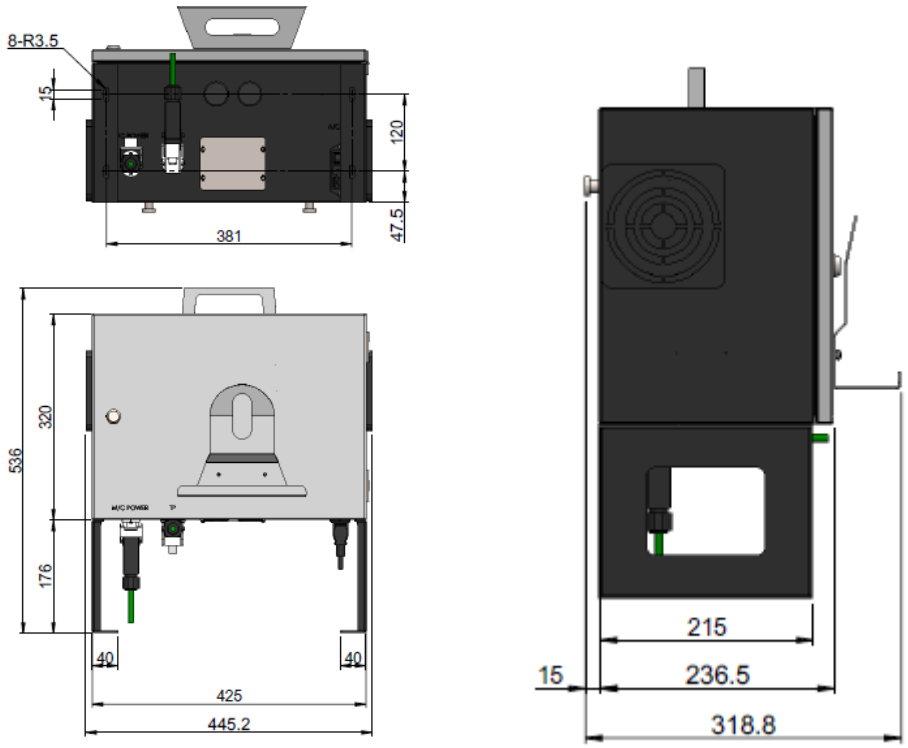


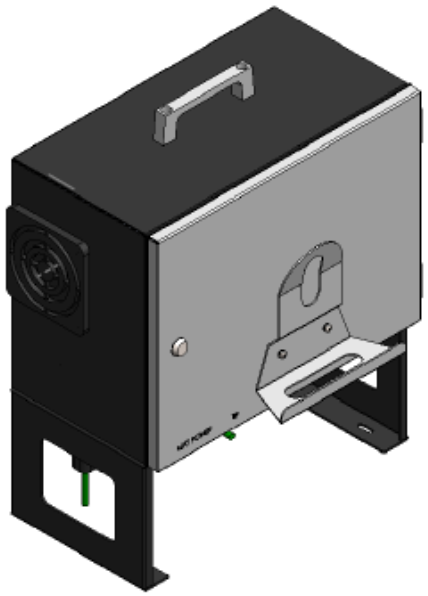

Payload diagram, Elfin 5
2.0kg
3.0kg
4.0kg
5.0kg
Lxy(mm)
Lz(mm)
0
10
20
30
40
50
60
70
80
90
0
50
100
150
200
250
300
350
400
450


Payload diagram, Elfin 10
4.0kg
6.0kg
8.0kg
10.0kg
Lxy(mm)
Lz(mm)
0
10
20
30
40
50
60
70
80
90
0
100
200
300
400
500
600

1.4 Electric Control Box

Size and Specification





Specification of electric control box:

Item	Specification
Weight	18.5Kg
Working temperature range	0~50ºC
Size	445.2*236.5*536mm
Paint color	Dark gray + white
External power input	200-240V AC,50-60Hz

Chapter 2 Safety Issue

2.1 Warning Signs

This manual will use the following safety signs at different levels:

Danger:

- Failure to follow the instructions may result in serious injury and even death.

Warning:

- Failure to follow the instructions may result in personal injury or severe equipment damage.

Caution :

- Failure to follow the instructions may result in equipment damage.

2.2 General Safety Reminder

Some of the potentially dangerous situations are listed according to different safety levels, and the rest of which are detailed in the chapters.

Danger :

- The operator must check robot and all electrical appliances in accordance with the instructions and warnings in Chapter 3 Mechanical Installation and Chapter 4 Electrical Ports. This operation requires cutting power.

Warning :

- Make sure that the arms and tools of the robot are installed properly and safely.
- Make sure that there is enough space for robot arms to move freely.
- Make sure that safety measures (such as guardrails, ropes, or protective screens) are taken near the robot operation area to protect the operator and surrounding people.
- Don't wear loose clothes or jewels when operating the robot. Please be sure to tie your long hairs up and keep them behind your head when operating the robot.
- Don't use the robot if it is damaged.
- If the software gives out a fatal error message, please activate the emergency stop quickly, write down the situation that causes the error, find out the related error codes on the code page, and contact us.
- Don't connect the safety device to the normal I/O port. Only secure port can be used.
- Make sure right installation configuration (such as robot's installation angle, weight in TCP, TCP offset, safety setting), and save the installation file and load it into the program.
- Free drive function (impedance / reverse drive) can only be used in the installation process after passing the risk assessment. Tools and obstacles should not have sharp corners or twists. Please ensure that the head and face of people are beyond the reach of robot.

- Pay attention to the movement of robot when using Teach Pendant.
- Don’t enter the safety scope of the robot or touch the robot when the system is running.
- Any collision will release a large amount of kinetic energy, which is much stronger than the kinetic energy of high-speed and overloading operations.
- Connecting different machines may pose risks or cause new danger. A comprehensive risk assessment on the whole installation process should always be carried out. When different safety and emergency stop performance levels are required, the highest performance level should always be selected. Always read and understand the user manual of all the devices used in the installation.
- Don’t modify the robot. Any modification of the robot could cause the unpredictable danger for integrators. The authorized reconfiguration of robot should be in accordance with the latest edition of all related service manuals. If the robot is changed or altered in any way, we refuse to take any responsibility.
- Robot and electric control box will produce heat in the operating process. The robot can cool down after cutting off the power and waiting for an hour.

Caution :

- When the robot is connected or work together with other machines that may damage the robot, it is strongly recommended that all functions of the robot and robot program shall be checked separately. It is recommended to use other temporary road points outside the mechanical workspace to detect the robot program.
- Prevent the robot from being exposed to permanent magnetic fields. A strong magnetic field can damage the robot.

2.3 Other Potential Risks

Please note that certain robot devices may have other major risks:

- Fingers are clamped between the robot foot and base.
- Fingers are clamped between the two arms.
- Sharp edges and sharp points on the tool or tool connector stab people's skin.
- Sharp edges and sharp points on the obstacle near the robot trail stab people's skin.
- People get hurt after being hit by the robot.
- A sprain or fracture caused by the impact of robot's payload on solid surface.
- The consequences of loosening bolts on fixed robot arm or tool.
- An item falls from the tool because of improper clamping or power off.
- An operation error caused by different e-stop buttons on different machines.

2.4 Risk Assessment

Risk assessment is one of the most important tasks that the integrator must complete. Robot itself is a partially completed machine, and the safety of installed robot depends on how the robot is integrated (such as tool, obstacle and other machinery).

It is recommended that the integrator should use the guidelines of ISO12100 and ISO10218-2 to carry out risk assessment.

The risk assessment needs to consider two situations: the risk of robot installation, robot demonstration and the risk of running robot.

For the non-collaborative installation of robot (e.g. when using dangerous tools), risk assessment may infer that integrators need to connect additional security devices (such as activating device) to protect themselves when programming.

2.5 Stop mechanism

All the moving parts of robot will stop when the e-stop is activated. After releasing the e-stop, no action of the robot is started. E-stop cannot be used as a risk reduction measure, but it can be used as a secondary protection device. If multiple e-stop buttons need to be connected, they should be included in the risk assessment of robot application.

2.6 Repair and Maintenance Instructions

All the safety instructions in this manual must be strictly observed when performing maintenance and maintenance work.

Danger :

- **Remove the main input cable from the bottom of electrical box to ensure it is completely power down; Disconnect other energy sources connected to the robot arm or electrical control box, and take the necessary precautions to prevent others from reconnecting the system energy during the maintenance.**
- **The grounding lines must be checked before restarting the system.**
- **Don't dismantle the power supply system of electric control box. The power supply system may retain high voltage (up to 600V) after the electric control box is turned off.**
- **Keep robot arm or electric control box away from water or dust.**
- **After maintenance, it must be checked to ensure that is meets the service requirements and safety level. It is necessary to observe effective national or local safety laws and regulations. Meanwhile, all safety functions should be checked.**

Chapter 3 Mechanical Installation

3.1 Open the Carton

Step 1

Open the carton and check whether the goods inside are consistent with the items on the packing list. If there is any loss or redundant, please contact the local sales office in time.

Step 2

Take out the robot; check whether the robot's appearance is intact, whether there is any scratch and other obvious defects. If there is any appearance or quality problem, please contact the local sales office in time.

Step 3

Move the robot to the designated installation station.

Warning :

- Don't open the carton violently, prevent the robot surface from scratches or impact and collision when opening the carton.
- Please unpack in a dry and clean external environment.
- When taking the machine out of the carton, please pay attention to protecting the appearance of the robot to avoid collision and scratches.
- Please refer to 3.2 Weight of Parts for precautions during handling.

3.2 Installation Environment Requirements

The robot should be installed indoors and meet the following requirements:

- Room temperature of 0-50℃ (to prevent excessive temperature change).
- Relative humidity of 10-80% (no condensation).
- Avoid direct sunlight.
- Keep it away from dust, soot, salt, metal powder and water.
- Avoid shock and vibration.
- Keep it away from flammable, explosive and corrosive gas-solid liquids.
- Keep it away from electrical interference sources.
- For the details about the installation space scope of the robot, please refer to the robot dimension chart and the specification table of electric control box.

3.3 Installation Space

Please confirm the installation space according to the Robot Working Space and the Size and Specification of Electric Control Box.

Warning：

- In addition to the space required for installing the robot and electric control box, please ensure the minimum space required for the following conditions: there is enough space to install robot terminal fixture and workspace, enough space for robot teaching, enough space for operator to implement installation, inspection and repair activities, and enough space of gas path.

- The minimum bending radius of the robot power cord is 90mm. When installing the cable, please make sure that there is enough space to install power supply signal line and other cables, so as to prevent the cable from over bending.

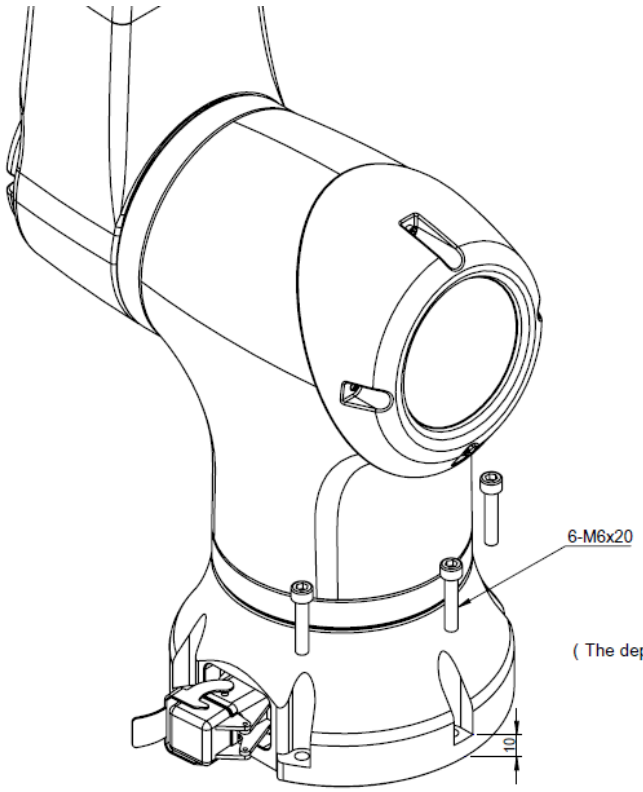
- Please make sure that the safety distance is at least 100mm longer than the maximum working space of the robot after installing the jig at the robot terminal.

3.4 Fixing the Robot (E03/E05 Robot)

Please use **6 M6** bolts (in accordance with ISO898-1 performance level 10.9 or 12.9) to fasten the robot onto the mounting base, and tighten screws with the torque of 15Nm.

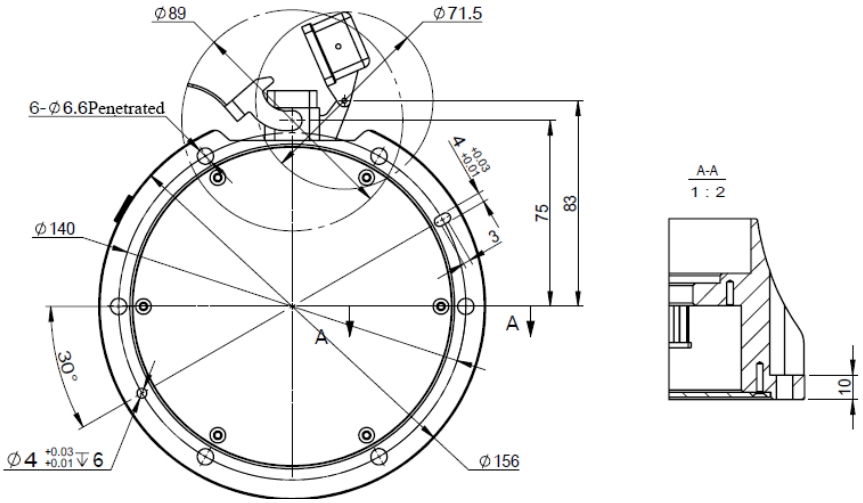
No installation platform is provided when you purchase the robot, please make it by yourself or buy a robot installation platform. The size and shape of the installation platform vary greatly depend on different robot systems, but please follow the basic requirements below:

- The installation platform should be at least 20mm thick. It is recommended to use the steel plate to suppress the vibration.
- It is recommended that the surface roughness of the installation platform should not exceed 25μm.



(The depth of the screw should be more than 10mm)

The installation dimensions of the robot base are shown in the following figure, and the measuring unit is mm.

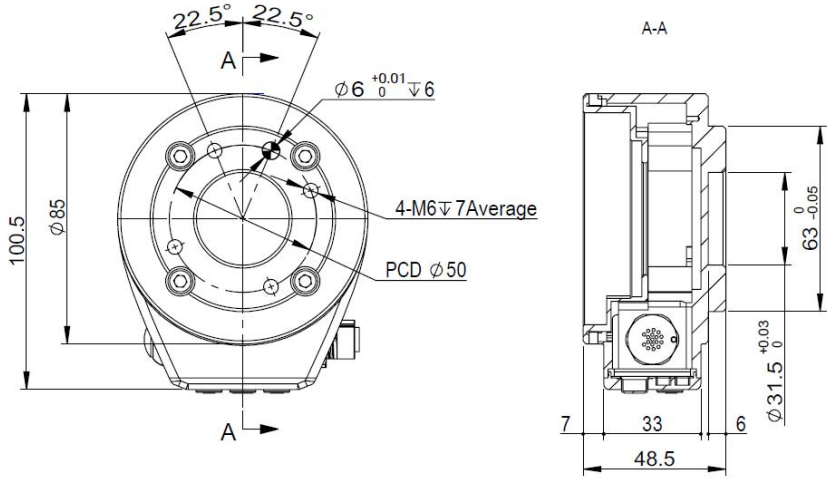


3.5 Installing Tools to the Terminal of Robot(E03/E05 Robot)

No end-effector is provided when you purchase the robot, please make it by yourself or buy an end-effector.

The screw hole for the fixed tool at the robot ends is **M6**. When fastening the tools, please use the bolts that conform to the ISO898-1 performance class 10.9 or 12.9, and use the tightening torque of 15Nm.

The robot end installation dimensions are shown in the following figure, and the measurement unit is mm.

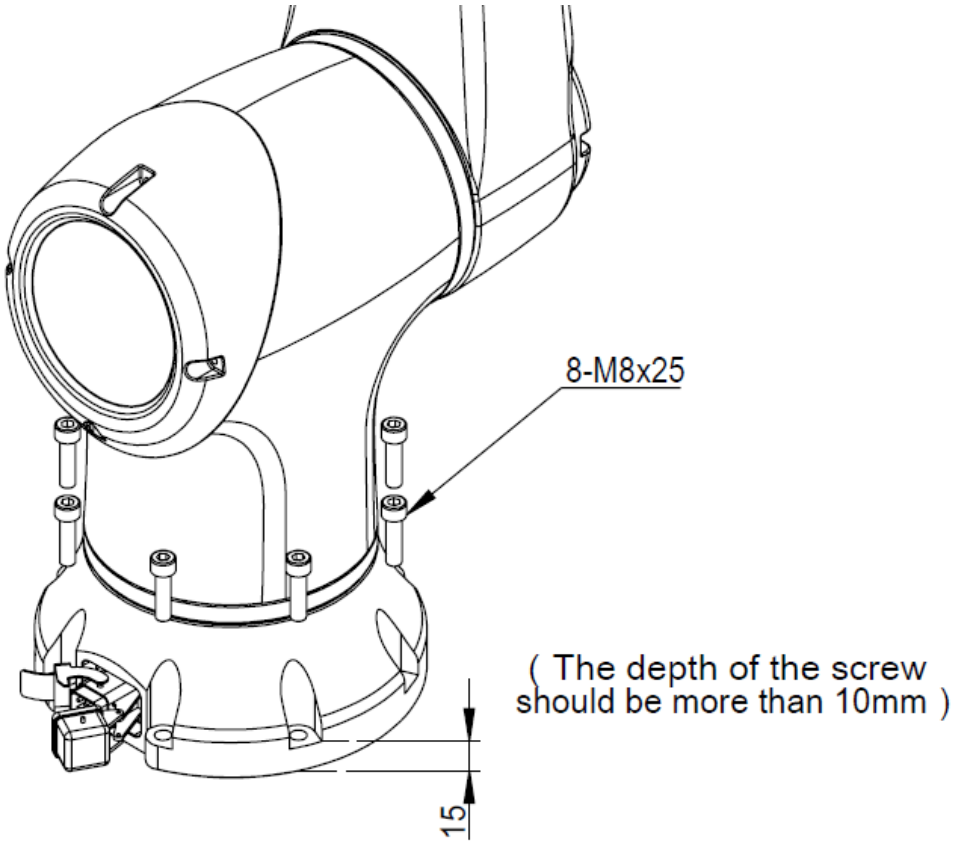


3.6 Fixing the Robot（E10 Robot）

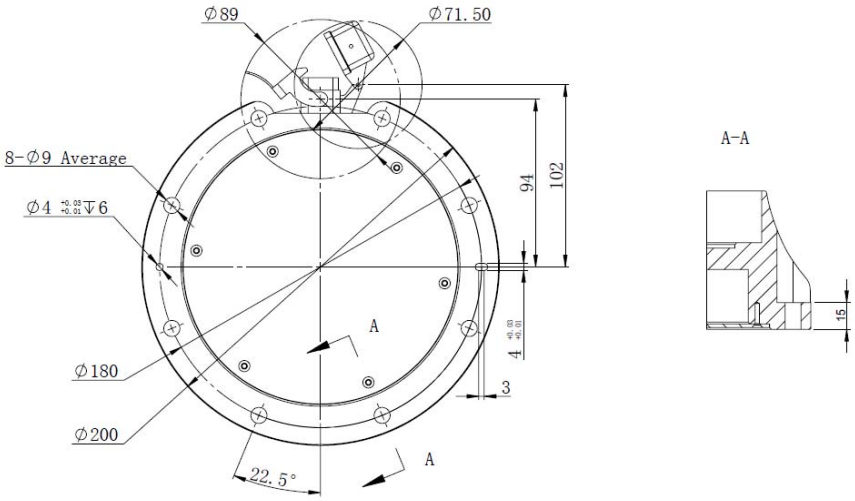
Please use **8 M8** bolts (in accordance with ISO898-1 performance level 10.9 or 12.9) to fasten the robot onto the mounting base, and tighten screws with the torque of 35Nm.

No installation platform is provided when you purchase the robot, please make it by yourself or buy a robot installation platform. The size and shape of the installation platform vary greatly depend on different robot systems, but please follow the basic requirements below:

- The installation platform should be at least 20mm thick. It is recommended to use the steel plate to suppress the vibration.
- It is recommended that the surface roughness of the installation platform should not exceed 25μm.



The installation dimensions of the robot base are shown in the following figure, and the measuring unit is mm.

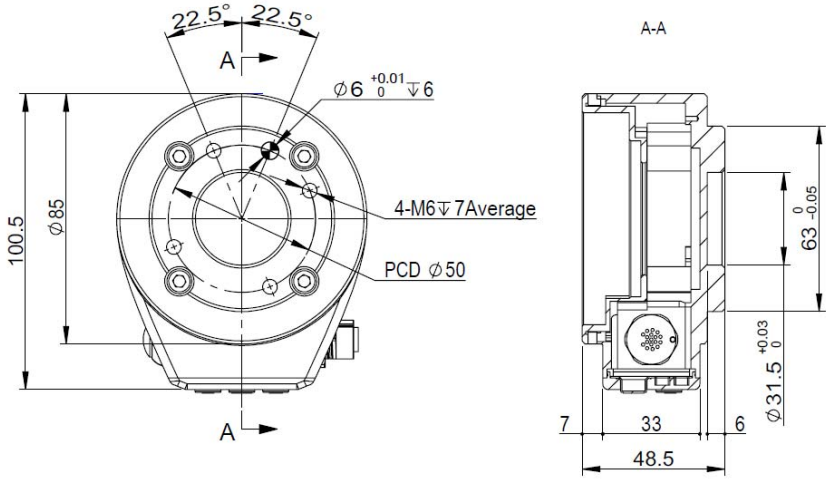


3.7 Installing Tools to the Terminal of Robot（E10 Robot）

No end-effector is provided when you purchase the robot, please make it by yourself or buy an end-effector.

The screw hole for the fixed tool at the robot ends is **M6**. When fastening the tools, please use the bolts that conform to the ISO898-1 performance class 10.9 or 12.9, and use the tightening torque of 15Nm.

The robot end installation dimensions are shown in the following figure, and the measurement unit is mm.



Chapter 4 Quality Warranty

4.1 Product Quality Warranty

In the principle of no prejudice to any claim agreement that may be reached between users (customers) and distributors or retailers, the manufacturer shall give customers a product quality warranty according to the following terms:

If any defect occurs due to defective manufacturing or materials within 12 months after new equipment and its components are put into operation (not more than 15 months if transportation time is included), Han's Robot shall provide necessary spare components while users (customers) shall provide labor for replacement with spare components. Related components shall be maintained or replaced with another component embodying the up-to-date technological level. This product quality warranty is invalid provided that equipment defects are caused by improper handling or failure to observe related information described in the user manual. This product quality warranty does not apply to or extend to any maintenance performed by authorized distributors or customers such as installation and software downloading. Users (Customers) must provide a purchase receipt and purchase date as valid evidence of enjoying the product quality warranty. According to this product quality warranty, any claim must be made within two months when the product quality warranty is not obviously fulfilled. Any equipment or components replaced or returned to Han's Robot shall be owned by Han's Robot. Any other claim arising from or in connection with equipment is not within the scope of this product quality warranty. Any terms of this product quality warranty do not try to limit or exclude customers' legal rights as well as the manufacturer's liability for any casualties due to its negligence. The duration of this product quality warranty shall not be extended due to any services provided according to the terms of this product quality warranty. Han's Robot reserves the right to collect replacement or maintenance costs to customers without violating the principles of this product quality warranty. The preceding regulations do not imply any change of burden of proof, harming the interests of customers.

If equipment shows any defect, Han's Robot shall not bear any resulting damage or loss, e.g. production loss or damage to other production equipment.

4.2 Disclaimer

Han's Robot reserves the right to upgrade products without prior notice because it devotes itself to continual improvement on product reliability and performance. Han's Robot does its best to ensure the accuracy and reliability of the contents of this manual, but disclaim any liability for any error or missing information.

Chapter 5 Appendix

5.1 Technical Specifications

E03 Robot

Name	Parameter
Weight	17kg
Payload	3kg
Reach	590mm
Joint range	+/-360°
Joint speed	135°/s
Tool	1m/s
Repeatability	+/- 0.05mm
Installation area	Φ 156mm
Degree of freedom	6 rotating joints
Control box dimensions	445.2*236.5*536mm
I/O ports	Digital input 3
	Digital Output 3
	Analog input 2
Cabinet I/O Port	Digital Input 16
	Digital Output 16
	Analog Input 2
	Analog Output 2
I/O power supply	Control box：24V 2A Terminal IO：24V 1.5A
Communication	TCP/IP
Programming	On-screen manipulation director;Remote access

IP class	IP54
Power	About 100W
Collaboration	10 advanced security configuration functions
Main material	Aluminum alloy
Operating ambient temperature	0-50°
External power input	200~240vac 50~60Hz
Cables	Control box connecting cable：5m
	Demonstrator connecting cable：5m

E05 Robot

Name	Parameter
Weight	23kg
Payload	5kg
Reach	800mm
Joint range	+/-360°
Joint speed	135°/s
Tool	1m/s
Repeatability	+/- 0.05mm
Installation area	Φ 156mm
Degree of freedom	6 rotating joints
Control box dimensions	445.2*236.5*536mm
I/O ports	Digital input 3
	Digital Output 3
	Analog input 2
Cabinet I/O Port	Digital Input 16
	Digital Output 16
	Analog Input 2
	Analog Output 2
I/O power supply	Control box：24V 2A Terminal IO：24V 1.5A
Communication	TCP/IP
Programming	On-screen manipulation director;Remote access
IP class	IP54
Power	About 180W
Collaboration	10 advanced security configuration functions

Main material	Aluminum alloy
Operating ambient temperature	0-50°
External power input	200~240vac 50~60Hz
Cables	Control box connecting cable：5m
	Demonstrator connecting cable：5m

E10 Robot

Name	Parameter
Weight	40kg
Payload	10kg
Reach	800mm
Joint range	+/-360°
Joint speed	J1-J2:85°/s J3-J6:135°/s
Tool	1m/s
Repeatability	+/- 0.05mm
Installation area	Φ 156mm
Degree of freedom	6 rotating joints
Control box dimensions	445.2*236.5*536mm
I/O ports	Digital input 3
	Digital Output 3
	Analog input 2
Cabinet I/O Port	Digital Input 16
	Digital Output 16
	Analog Input 2
	Analog Output 2
I/O power supply	Control box：24V 2A Terminal IO：24V 1.5A
Communication	TCP/IP
Programming	On-screen manipulation director;Remote access
IP class	IP54
Power	About 350W
Collaboration	10 advanced security configuration functions

Main material	Aluminum alloy
Operating ambient temperature	0-50°
External power input	200~240vac 50~60Hz
Cables	Control box connecting cable：5m
	Demonstrator connecting cable：5m

5.2 Limiting Security-Related Functions

Limiting Safety Function	Description
Joint position	Min. and Max. joint angular positions
Joint speed	Max. joint angular speed
TCP position	Plane where the TCP position of the robot is limited in Cartesian space
TCP speed	Max. speed of robot TCP
TCP force	Max. thrust of robot TCP

5.3 Electrical Safety Specifications

Safety Input	Description
Robot emergency stop	Execute Class 1 stop* and use system emergency stop to notify the body
Emergency stop button	Execute Class 1 stop* and use system emergency stop to notify the body
System emergency stop	Execute Class 1 stop*
Protective stop	Execute Class 2 stop*
Emergency stop reset	Restore the robot from protective stop state

*** Term explanation：**

- Class 0 stop: The robot stops operation immediately after the robot power supply is cut off. This is an uncontrolled stop. The robot may deviate from a route set in the program because every joint is braked at the fastest speed.

- This protective stop can be used only when a safety evaluation limit is exceeded or when an error occurs in the safety evaluation part of the control system.

- Class 1 stop: The robot stops when you stop it for power supply to it. The power supply is cut off after the robot stops. This is a controlled stop. The robot will follow a route compiled in the program. The power supply is cut off after 1s or once the robot keeps its feet.

- Class 2 stop: Controlled stop during power-on of the robot. The robot stops all actions within 1s. The control of the safety evaluation control system enables the robot to stay in the stop position.