# X Series Collaborative Robot User Manual

**（Hardware）**

**V04**

Guangzhou Auctech Automation Technology Ltd

## Trademark Statement

The words or images like “AUCTECH” are protected by trademark registration. The registered trademark information can be found in the open trademark registration information.
All other trademarks or registered trademarks mentioned in this manual are the property of their respective owners.

## Attention

Your purchase of products, services or features, etc., shall be subject to the commercial contract and terms and conditions of Guangzhou Auctech Automation Technology Ltd. All or part of the products, services or features described in this manual may not be within the scope of your purchase or use. Unless otherwise agreed in the contract, Guangzhou Auctech Automation Technology Ltd makes no representations or warranties, either express or implied, with respect to the contents of this manual.
Due to product version upgrade or other reasons, the contents of this manual will be updated from time to time. Unless otherwise agreed, this manual is used only as a guide, and all statements, information and recommendations in this manual do not constitute any guarantee either express or implied.

## Guangzhou Auctech Automation Technology Ltd

**Add:**
Hongshi Business Building, 11 Kehua Road, SCI-TECH Industry Park, Taihe Town, Baiyun District, Guangzhou, CHINA
**Tel:** +86 20 84898493
**E-mail:** info@auctech.com.cn
**Web:** www.auctech.com.cn

# Content

# 1 Preface

## 1.1 Intended Audience

This document provides operating instructions for the AUCTECH Collaborative Robot, so that users can learn more about the robot basic information and use the robot more safely and conveniently. Be sure to operate this robot on the basis of careful reading and full understanding of this document.

This document applies for the following users:

- **On site robotic engineer**
- **Robotic software engineer**
- **Hardware installation engineer**
- **On-site Maintenance engineer**
- **System maintenance engineer**

Operators with basic training are allowed to operate the robot.

## 1.2 Representation of Warnings and Notes

The table below defines general hazards related symbols, please read through the description carefully.

| Symbol | Description |
|---|---|
| Danger | Used to warn of emergency situations that, if not avoided, could result in death or serious personal injury. |
| Warning | Used to warn of potentially dangerous situations that, if not avoided, could result in death or serious personal injury. |
| Caution | Used to warn of potentially dangerous situations that, if not avoided, may result in moderate or minor personal injury. |
| Care | Used to convey device or environmental security warnings that, if not avoided, may result in damage to the device, loss of data, degradation of device performance, or other unpredictable results. Caution does NOT involve personal injury. |
| Tips | Used to highlight important / critical information, best practices and tips.<br>"Tips" is not a safety warning message, does not involve personal, equipment and environmental damage information. |

## 1.3 Special Statement

This manual is only used as a guide. Its content (such as equipment appearance, software interface) is based on laboratory equipment information. The content provided in this manual is of general guidance and does not guarantee that all usage scenarios cover all models. Due to the software upgrade and equipment model inconsistency, the content provided in the manual may NOT be consistent with the robot used by the user. Please take the information of user equipment as the standard, this manual will no longer address the differences caused by the above situations.

The maximum value provided in this manual is the maximum that a device achieves in a lab-specific scenario that meets the appropriate standards (For example, constant temperature, humidity, interference free environment, typical operating conditions and etc.). In reality working situation, the maximum value of equipment testing may NOT be consistent with the data provided in the manual, due to different working conditions, specific working conditions and inconsistent testing methods.

## 1.4 Revision History

Revision history contains all documentation changes. The newest documentation contains changes in all previous versions.

**Documentation version（2023-03）**

The first time to integrate, initially add conte

# 2 Safety

## 2.1 Abstract

This section describes important safety and risk assessments that you need to be aware when installing, applying, and maintaining on robot and its components. The user must read and fully understand this information before the robot is powered on for the first time.

Before performing any operations, be sure to read all operating instructions provided with the equipment, in particular, instructions that may endanger personal safety and equipment safety, such as hazards, warnings, and cautions, to minimize the chance of an accident. When this document differs from the documentation shipped with the device, the documentation shipped with the device shall prevail.

The technicians responsible for installing and maintaining the equipment must be a trained person who has proper methods of operation and all safety precautions. Only trained and qualified technicians are able to perform equipment installation and maintenance.

## 2.2 Limitation of Liability

This information neither includes how to design, install and operate a complete robot system, nor any peripherals that affect the overall system. In order to protect personal safety, an outstanding system must be designed and installed in accordance with the safety requirements stipulated in the standards and regulations of the country where the robot is installed.

The robot integrator is responsible for ensuring that the robot system complies with the applicable safety laws and regulations of the country or region where the robot is located and that the necessary safety equipment for the protection of the robot system operator is properly designed and correctly installed. Limitation of Liability

Specifically including but not limited to the following:

- **Ensure that the robot system meets all basic requirements；**
- **Perform a risk assessment of the complete system；**
- **Ensure the design and installation of the entire system is accurate；**

- **Make appropriate security settings in the software and ensure that it will not be modified by the user;**
- **Develop detailed operating instructions;**
- **Issue a declaration of conformity;**
- **Collect all information in technical documents;**
- **Label the integrator's logo and contact information on the installed robotic system.**

**Guangzhou Auctech Automation Technology Ltd** is committed to providing reliable safety information and will not be liable unless there is intentional or gross negligence by **Guangzhou Auctech Automation Technology Ltd** in providing reliable safety information. It is important to declare that even if all operations are carried out in a safe manner, there is no guarantee that the robot system will not cause personal and property damage to the user.

**Guangzhou Auctech Automation Technology Ltd** will not be liable for the loss of users caused by the following reasons:

- **Force Majeure events (e.g., natural disasters, fires, wars, etc.);**
- **Natural damage or wear of the robot system;**
- **The site operating environment (e.g., voltage, temperature, humidity, etc.) or external factors (e.g., external interference, etc.) cannot meet the environmental requirements for normal operation as indicated;**
- **The robot system is not installed correctly (including not reinstalled correctly after relocation);**
- **due to the willful or negligence of the user or a third party, improper use (including the user's failure to use in accordance with this User's Manual and/or other requirements of Guangzhou Auctech Automation Technology Ltd) or willful sabotage.**

**Unless otherwise agreed, Guangzhou Auctech Automation Technology Ltd will not be liable for the indirect, special and incidental losses caused by the use of the robot system, including but not limited to the loss of revenue, actual or expected revenue, business loss, opportunity loss, goodwill loss, reputation loss, data loss, damage or leakage, etc.**

## 2.3 Risk Assessment

Risk assessment is one of the most important tasks that integrators must accomplish. The robot itself is a partially completed machine, and the safety of the robot installation depends on how the robot is integrated (e.g. tools, obstacles and other machineries).

It is recommended that integrators perform risk assessment in accordance with ISO12100 (GB 15706) and ISO10218-2 (GB 11291.2). Alternatively, technical specification ISO/T 15066 (GB/T 36008） may be selected as additional guidance. Integrators performing a risk assessment should consider all procedures during the entire lifespan of the robot, including but not limited to:

- **Teach robots when developing robots;**
- **Fault diagnosis and maintenance;**
- **General operation of robot installation.**

Risk assessment must be performed before the robot arm is powered on for the first time. Part of the risk assessment performed by the integrator is the necessity to identify the correct security configuration settings, emergency stop buttons and additional protections for specific robot applications.

The following list identifies the significant risks that integrators must consider. Please note that there may be other significant hazards from certain robotic devices.

- **Finger is clamped between joint 4 and joint 5;**
- **Sharp edges and sharp spots on the tool or the tool connector may cause damage to human skin;**
- **The obstacles sharp edges and sharp spots, which is closed by the robot track, may be dangerous to human skin;**
- **Sprains or fractures due to impact between the robot payload and a solid surface;**
- **Consequences due to loosening of bolts used to secure robot or tools;**
- **Items fall off the tool. For example, due to insufficient clamping or accidentally power down;**
- **Operating error due to different emergency stop button allocation and types.**

**If the robot is installed in a non**-cooperative application (e.g. using dangerous tools) where the risk cannot be adequately eliminated by using its internal safety functions, the system integrator must install other protective devices based on the risk assessment (e.g. Installing a safety enclosure that can provide protection to the integrator during installation and programming).

## 2.4 Safety Operations

### 2.4.1 Emergency Stop

Emergency stop takes precedence over all the other robot control operations. Pressing emergency stop will cause all controlled hazards to stop, removing the motor power from the robot drive. It will remain in effect until reset manually.

Activate emergency stop to immediately stop the robot from any motion. The user must perform a restoration procedure, resetting the emergency stop button and pressing the "Power On" button on demonstrator, to resume normal operation. Emergency stop shall not be used as a risk reduction measure, but as a secondary protective device.

Emergency stop must not be used for normal program stop; constantly pressing may result in additional unnecessary wear on the robot.

# 2.5 Safety-related Functions and Interfaces

## 2.5.1 Introduction

AUCTECH X series are equipped with a range of built-in safety functions as well as safety I/O, digital and analog control signals to connect to other machines and additional protective devices.

| | |
|---|---|
| Caution | ● **The use and configuration of safety functions and interfaces must follow the risk assessment procedures for each robot application.**<br>● **If the robot discovers a fault or violation in the safety system (e.g. if one of the wires in the Emergency Stop circuit is cut or a safety limit is violated) then a Stop Category 0 is initiated.**<br>● **The stopping time should be taken into account as part of the application risk assessment.** |

| | |
|---|---|
| Warning | ● **The use of safety configuration parameters different from those determines by the risk assessment can result in hazards that are not reasonably eliminated or risks that are not sufficiently reduced.**<br>● **Ensure tools and grippers are connected appropriately so if there is an interruption of power, no hazards occur.**<br>● **The end effector is not protected by the X safety system. The end effector and / or connection cable is not monitored.** |

## 2.5.2 Stop Categories

Depending on the circumstances, the robot can initiate three types of stop categories defined according to IEC 60204-1. These categories are defined in the following table.

| Stop Category | Description |
|---|---|
| 0(SS0) | Stop the robot by immediate removal the power |
| 1(SS1) | Reduce joints acceleration to 0 as soon as possible. Once each joint stopped, brake applied and power removed |
| 2(SS2) | Stop the robot with power available to the drives, while maintaining the trajectory. Drive power is maintained after robot is stopped, no brake applied. |

Swap between each stop categories:

The timer runs as soon as any stop category 1 occurs. At 500ms, if the robot is still running over speed, the stop category will be automatically swapped to category 0.

## 2.5.3 Safety functions

The X robot safety functions, are meant to control the robot system, such as the robot with its attached tool/ end effector. The robot safety functions are used to reduce robot system risks determined by the risk assessment. Positions and speeds are relative to the base of the robot.

The control unit safety functions are listed as follow:

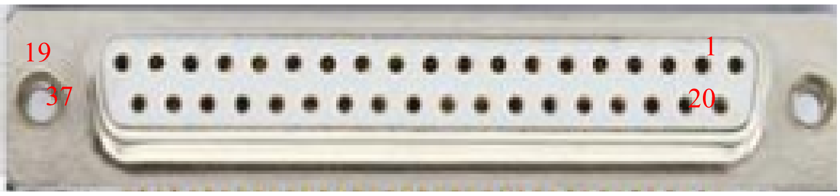
| Safety Function | Description |
|---|---|
| Emergency stop (ES) | Perform SS1 |
| Protective stop | Perform SS2 |
| Safe Operating Stop (SOS) | After SS2 is executed, SOS monitoring will be triggered to monitor the current position deviation of the robot. If it is violated, SS0 will be triggered |
| Joint Safe limited position (SLP) | According to the threshold setting, SS2 is triggered when the joint position reaches the threshold. If the trigger joint is limited, SS0 is fired directly |
| Joint Safe limited speed (SLS) | According to the threshold setting, SS2 is triggered when the joint velocity reaches the threshold. If the joint speed limit is triggered, SS0 is fired directly |
| TCP position limit | The safe plane can be set to limit the operating area of the robot, which is set according to the threshold value. When the threshold value is reached, SS2 is triggered. If the safety plane is triggered, the safety controller directly triggers SS0. Up to 6 security planes and 3 TCP coordinate systems are allowed |
| Tcp speed limit | According to the threshold setting, SS2 is triggered when the threshold is reached. If the TCP speed limit is triggered, the safety controller directly triggers SS0 |
| elbow pos limit | According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow position limit is triggered, the safety controller fires SS0 directly |
| elbow speed limit | According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow speed limit is triggered, the safety controller fires SS0 directly |
| joint force limit | According to the threshold setting, SS2 is triggered when the threshold is reached. If joint torque limits are triggered, the safety controller directly triggers SS0 |
| tcp force limit | According to the threshold setting, SS2 is triggered when the threshold is reached. If the end force limit is triggered, the safety controller directly triggers SS0 |
| elbow force limit | According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow force limit is triggered, the safety controller fires SS0 directly |

| | |
|---|---|
| power limit | According to the threshold setting, SS2 is triggered when the threshold is reached. If power limits are triggered, the safety controller directly triggers SS0 |
| mode switch input | You can optionally enable this input , you can toggle through the UI; But not both. SS2 is triggered when the mode is switched. If the script is currently running, the script is paused and can continue to run later. |
| enable device input | You can optionally enable this input. This input is valid only in manual mode, not in automatic mode. Violation triggers SS2. |
| protective stop input | Valid in all modes, triggering SS2. If the reset input is not activated, after the signal disappears, it will reset automatically. Otherwise, it can reset only when the reset input is triggered. |
| protective stop reset input | You can optionally reset the signal input. If the safety protection reset is activated, when the trigger safety protection stops and the trigger signal disappears, the channel signal input is required before the movement. The rising edge is effective and the high level needs to be maintained at 500ms |
| automatic protective stop input | Only valid in automatic mode, triggering SS2. After the signal disappears, the safe mode resumes Normal |
| automatic protective stop reset input | Similar to the Protective Stop Reset Input, only valid for protective stops triggered by Automatic Protective Stop Input. |
| system emergency stop output | This signal will be output only when the system is triggered by an emergency stop |
| protective stop output | Protective Stop output. This signal is emitted when the Protective Stop Input is triggered |
| automatic protective stop output | Automatic mode protective stops output, only when the protective stops triggered in automatic mode, the signal will be output. |
| reduce mode | Trigger the reduction mode, using the parameters associated with the reduction mode. |
| reduce mode output | Globally, the signal can be output. |
| recovery mode | When the joint limit, or TCP limit, is exceeded, a reboot is required to enter recovery mode. Recovery mode to limit speed not more than 30 deg/s, the end of the speed of less than 250 mm/s |

### 2.5.4 Security IO port

Security IO port is to provide external control box scram and safety input and output port, including 1 road stop signal input (passive signal), and 1 road stop output feedback (active), 1 road protective stop input (passive), 2 road safety input can be configured (passive), 2 way configurable security output (active), Among them, the emergency stop signal input, protective stop input and configurable safety input are valid for high level, and the effective level is 11V-30VDC; In addition, when using configurable safety output and emergency stop feedback output, relay is needed for switching. Can be configured for safety input: protective reset input, automatic mode protective stop input, automatic mode protective reset input, reduce mode input. Configurable security output can be configured as: guard stop output, automatic mode guard stop output, reduce mode output. Its interface definition is shown in Table 11:

Security IO port definition




| No. | Signal Definition | No. | Signal Definition |
|---|---|---|---|
| 1 | EI1+ (Emergency stop signal input 1+) | 2 | EI1- (Emergency stop signal input 1-) |
| 3 | EI2+ (Emergency stop signal input 2+) | 4 | EI2- (Emergency stop signal input 2-) |
| 5 | PS1+ (Protective stop input 1+) | 6 | PS1- (Protective stop input 1-) |
| 7 | PS2+ (Protective stop input 2+) | 8 | PS2- (Protective stop input 2-) |
| 9 | CI1_1+ [Security inputs can be configured 1（1+）] | 10 | CI1_1- [Security inputs can be configured 1（1-）] |
| 11 | CI1_2+ [Security inputs can be configured 1（2+）] | 12 | CI1_2- [Security inputs can be configured 1（2-）] |
| 13 | CI2_1+ [Security inputs can be configured 2（1+）] | 14 | CI2_1- [Security inputs can be configured 2（1-）] |
| 15 | CI2_2+ [Security inputs can be configured 2（2+）] | 16 | CI2_2- [Security inputs can be configured 2（2-）] |
| 17 | Reserved | 18 | Reserved |
| 19 | Reserved | 20 | Reserved |
| 21-23 | Reserved | 24-25 | Reserved |
| 26 | CO2_2- [ Security output can be configured 2（2-）] | 27 | CO2_2+ [ Security output can be configured 2（2+）] |
| 28 | CO2_1- | 29 | CO2_1+ |

| | | | |
|---|---|---|---|
| | [ Security output can be configured 2（1-）] | | [ Security output can be configured 2（1+）] |
| 30 | CO1_2-<br>[ Security output can be configured 1（2-）] | 31 | CO1_2+<br>[ Security output can be configured 1（2+）] |
| 32 | CO1_1-<br>[ Security output can be configured 1（1-）] | 33 | CO1_1+<br>[ Security output can be configured 1（1+）] |
| 34 | EO1-( Emergency stop feedback output 1-) | 35 | EO1+( Emergency stop feedback output 1+) |
| 36 | EO2-( Emergency stop feedback output 2-) | 37 | EO2+( Emergency stop feedback output 2+) |

## 2.6 The Risk of Collision

There is still a collision detection blind zone during the actual operation of the robot. Users must pay attention to the risk of collision detection failure under special working conditions. Typical three types of operating conditions are as follows.

Scenario 1: When the robot tool flange is outside the range A from the center of the robot base, if the robot moves along the direction of the red arrow in Figure 2.6.1 and Figure 2.6.2, the robot is less sensitive to external forces in the moving direction. The risk of pinching is more likely to occur; when the robot moves along the direction of the green arrow in Figure 2.6.1 and Figure 2.6.2, if the robot collides with the external environment, the external force generated by the collision is more sensitive.

| Model | Range A mm |
|---|---|
| X3-618 | 500 |
| X5-910 | 750 |
| X7-910 | 750 |
| X10-1300 | 1000 |
| X10-2000 | 1500 |
| X12-1300 | 1000 |
| X14-1400 | 1000 |
| X16-960 | 750 |
| X20-1100 | 900 |
| X25-1800 | 1300 |

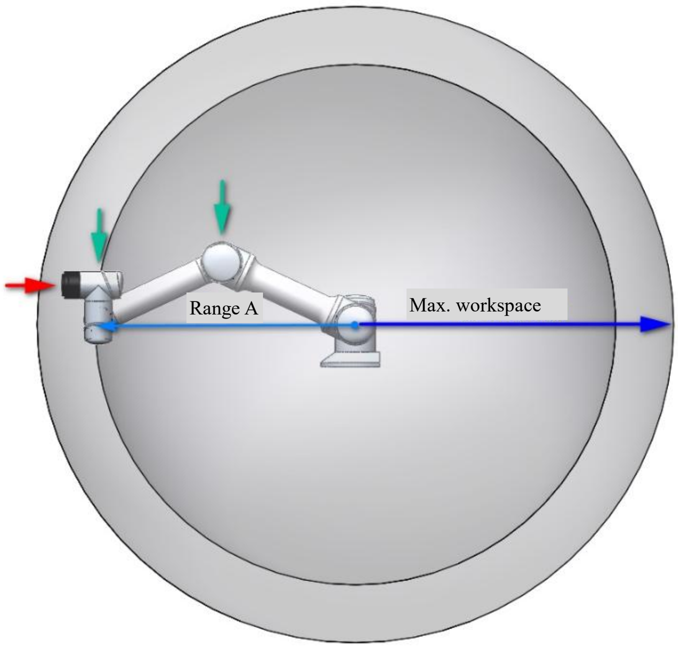



Image 2.6.1 Scenario 1: robot front view

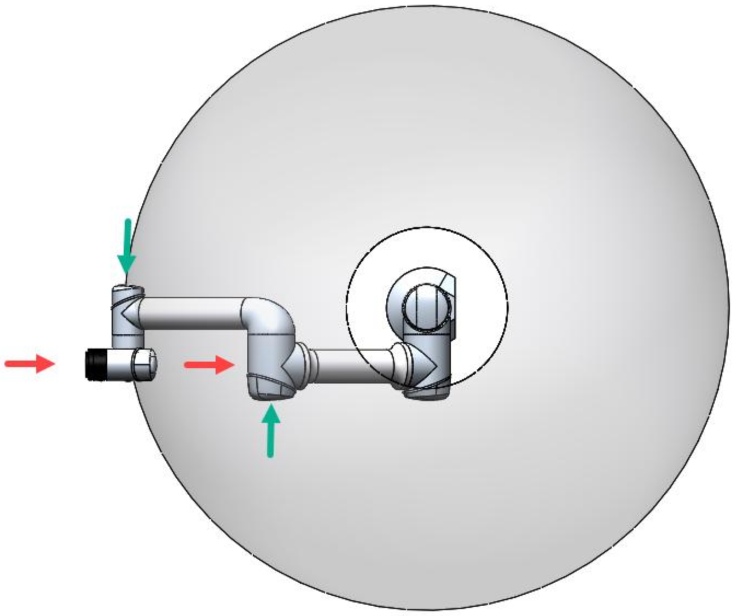


Image 2.6.2 Scenario 1: robot top view

Scenario 2: Centering on the Z-direction of the robot base coordinate system, the radius is shown in Figure 2.6.3. If the contact point is within this range B, and the contact force direction is perpendicular to the plane of the joints of the joints 2 and joint 3, the collision detection function is difficult to detect collisions between the robot and the outside world. As the red arrow shown in Figure 2.6.3 in Figure 2.6.4; if the force direction between the robot and the outside is consistent with the Z direction of the robot base, the robot is more sensitive to the external force generated by the collision, as the green arrow shown in Figure 2.6.3.

| Model | Range B mm |
|---|---|
| X3-618 | 150 |
| X5-910 | 200 |
| X7-910 | 200 |
| X10-1300 | 350 |
| X10-2000 | 500 |
| X12-1300 | 350 |
| X14-1400 | 500 |
| X16-960 | 350 |
| X20-1100 | 500 |
| X25-1800 | 600 |

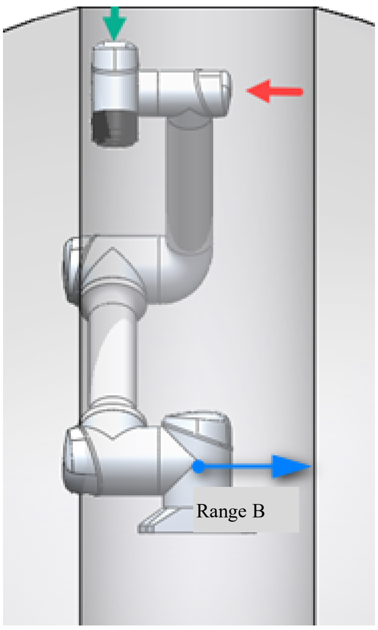



Image 2.6.3 Scenario 2: robot front view

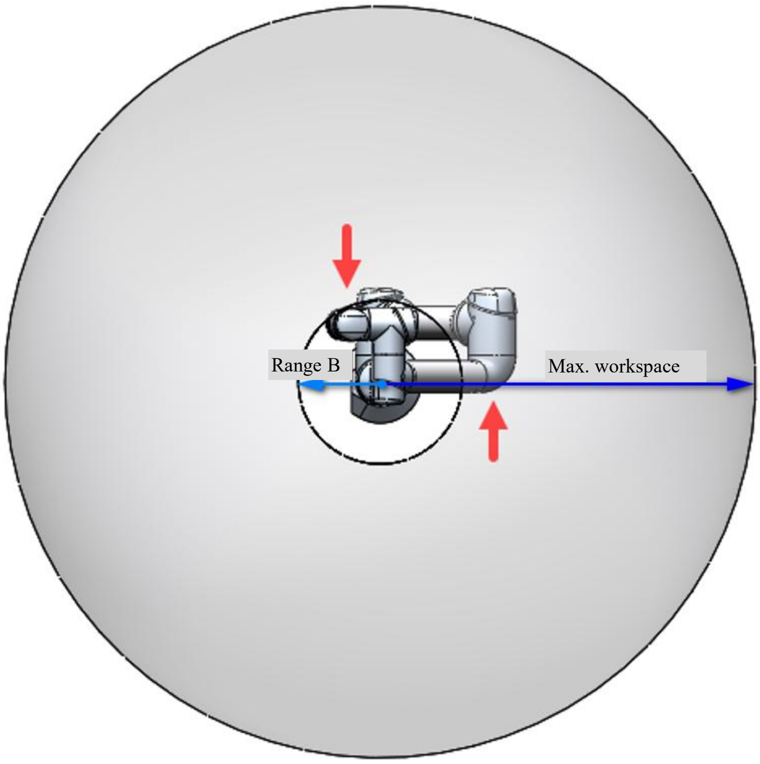



Image 2.6.4 Scenario 2: robot front view

Scenario 3: When the robot collides with the outside world, and if the collision point is located in the spherical range with a radius C on the robot base, the robot is more difficult to detect the collision regardless of the pose and state of the robot. It is more prone to the risk of pinching, as the arrow shown in Figure 2.6.5 and in Figure 2.6.6; when the collision point is outside the range, and does not meet the conditions of the collision detection zone described in scenario 1 and scenario 2. At the time, the robot is more likely to detect collisions with the outside world, as the green arrow shown in Figure 2.6.5 and in Figure 2.6.6.

| Model | Range C mm |
|---|---|
| X3-618 | 150 |
| X5-910 | 200 |
| X7-910 | 200 |
| X10-1300 | 350 |
| X10-2000 | 500 |
| X12-1300 | 350 |
| X14-1400 | 500 |
| X16-960 | 350 |
| X20-1100 | 500 |
| X25-1800 | 600 |

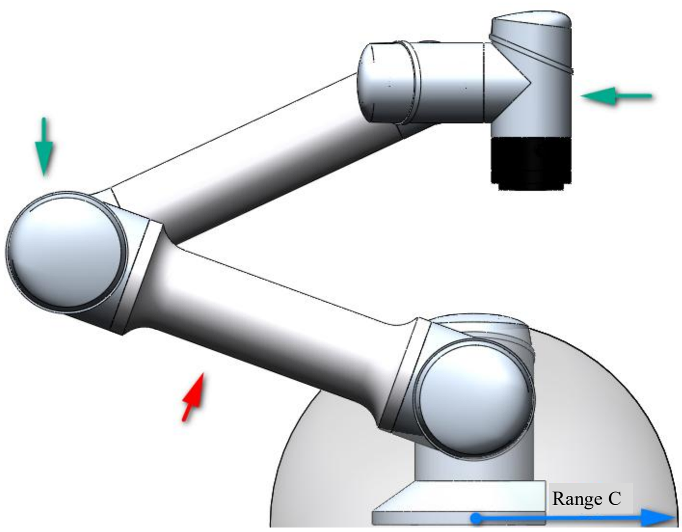



Image 2.6.5 Scenario 3: robot side view

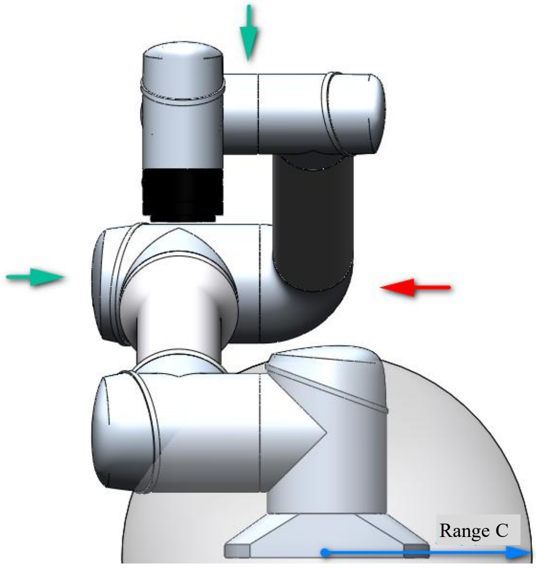



Image 2.6.6 Scenario 3: robot front view

For all above-described scenarios, if the robot moves in a direction that is insensitive to external collision detection, considering the limitation of the cooperation between the robot and the outside world, the running speed at this time should be reduced as much as possible.

## 2.7 Risk of Stall at Robot Singularity

When the robot performs motion planning (straight line, arc, etc., excluding joint motion) near the singularity point, it will automatically reduce speed. When teaching, avoid the singularity point or pass the singularity point with joint motion. For the X series configuration, there are shoulder singularities, elbow singularities and wrist singularities.

### 2.7.1 Shoulder Singularity

When the wrist joint center O6 is on a joint axis J1, the shoulder singularity is caused at this time, resulting in no solution for joint 1. When O6 is located very close to J1, it will also be affected strangely. At this time, moving the end may cause joint 1 to overspeed. Refer to the picture below for the singular pose near the shoulder.

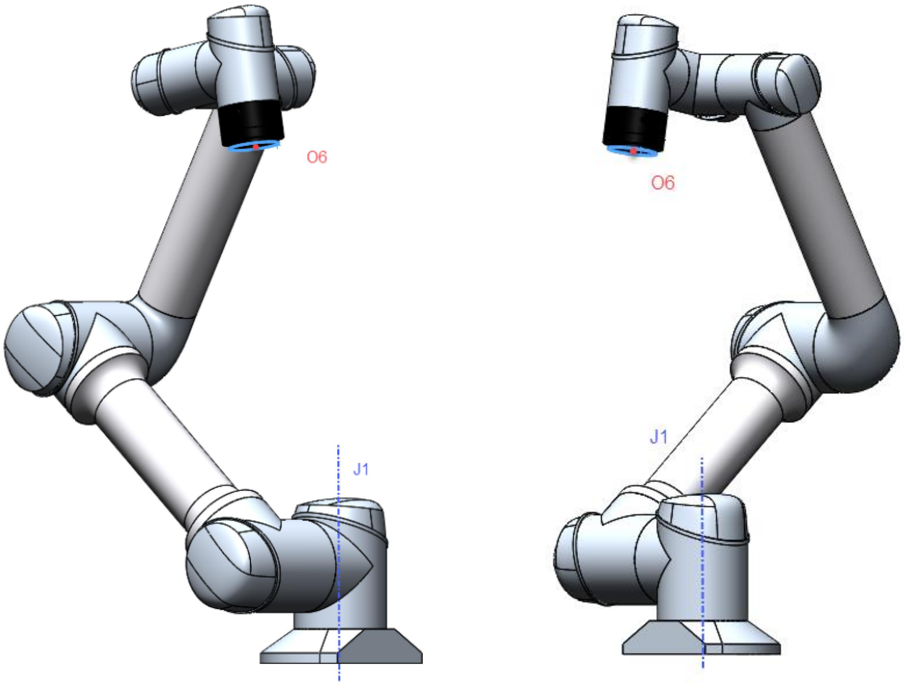



Image 2.7.1 Shoulder singularity pose reference pose

## 2.7.2 Elbow singularity

When the axes of the two, three, and four joints J2, J3, and J4 are coplanar, at this time, the two joints have no solution. Simply, when joint 3 is near 0 degrees in a near singularity, moving the end may cause 2 joints, 3 joints, and 4 joints to overspeed. Refer to the figure below near the elbow singularity:

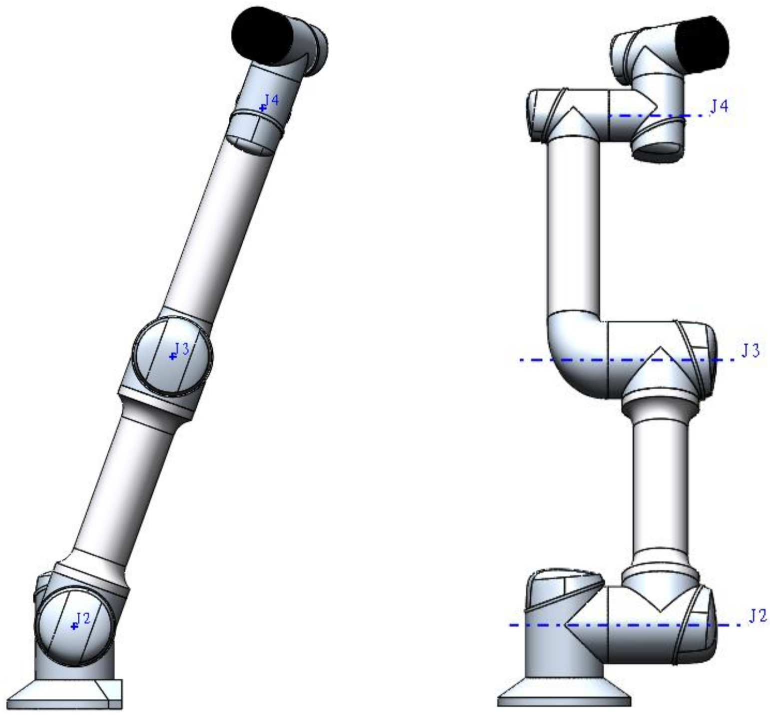



Image 2.7.2 Elbow Singularity Pose Reference

## 2.7.3 Wrist singularity

When the joint 5 is 0 degrees, the joint 6 has no solution at this time, causing the wrist to be singular. When joint 5 is close to 0 degrees, it is a strange posture near the wrist. At this time, moving the end may cause 4 joints, 5 joints, and 6 joints to overspeed. Refer to the following figure:

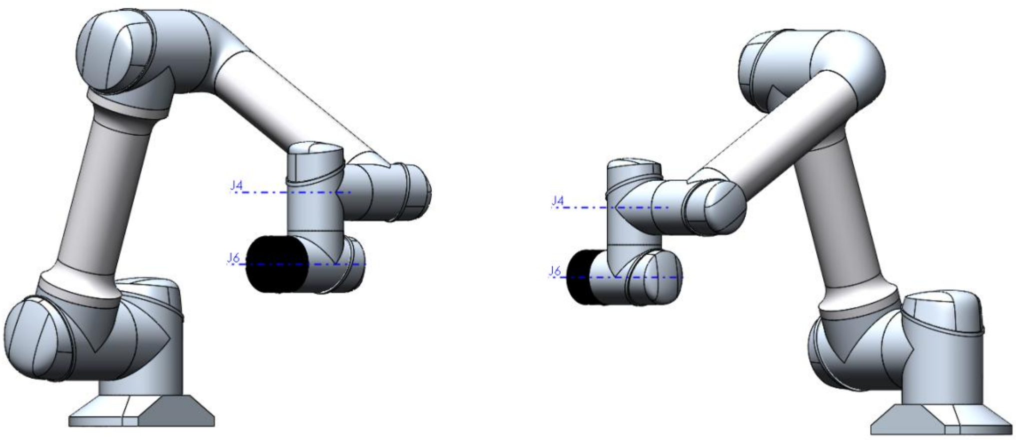



Image 2.7.3 Wrist Singularity Reference

When the robot reaches or approaches the singularity, the planned movement based on Cartesian coordinates cannot be correctly reversed to the joint motion of each axis, and the movement planning cannot be performed correctly. The off motion or move j motion instruction can be used.

| | |
|---|---|
| ⚠Caution | ● **Avoid using commands such as straight lines, arcs, and moving the ends in the directions of X, Y, Z, RX, RY, and RZ near the singularity points. The robot is at risk of stalling.**<br>● **For trajectories with singular risks, they must be fully evaluated before running.** |

# 3 Production Introduction

## 3.1 Overview

The collaborative robot system consists of the following parts:

- Robot arm
- Control box
- Cables
- Software
- Teach Pendant (optional)
- Optional accessories

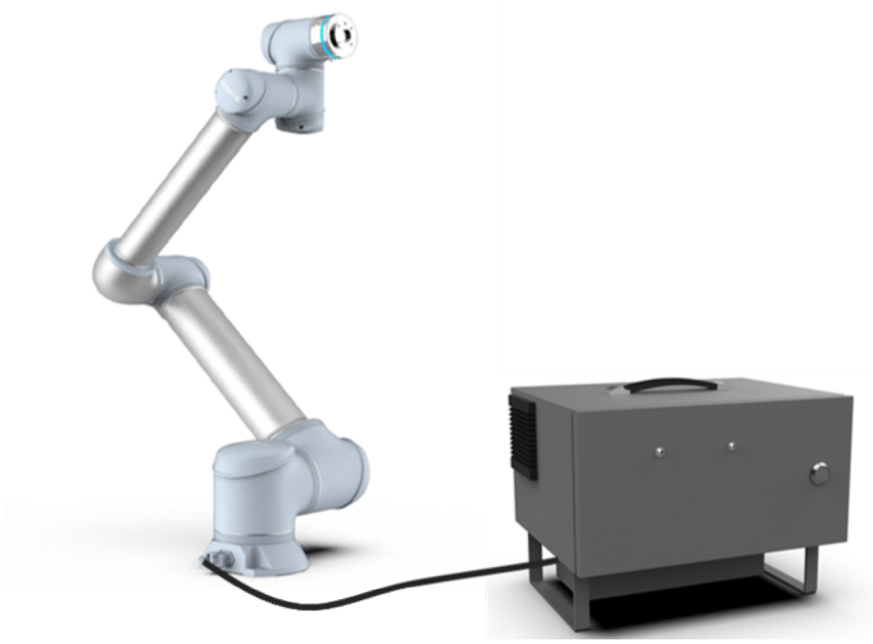


Figure 3- 1 Collaborative Robot system

## 3.2 Robot

### 3.2.1 Introduction

The X collaborative robot consists of six modular joints. With traction teaching, collision detection and other functions, each joint of the robot is equipped with a position sensor to detect the joint operation position and equipped with a reliable brake to stop it in time. Robot can be installed in any direction.

The robot consists of the following components:

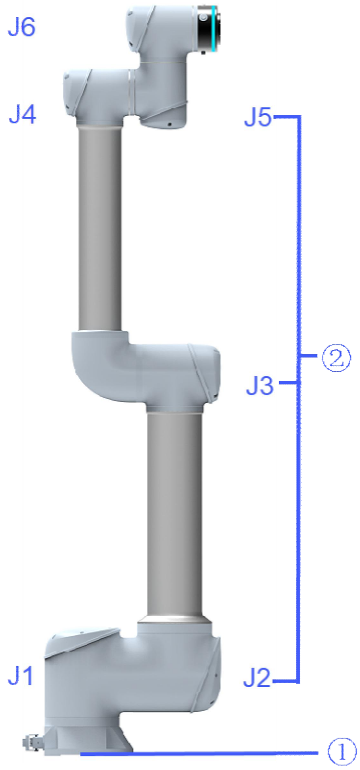



Figure 3- 2 XCORE Robot

①Base module ② Joint module

**Base module**

The base is located at the bottom of the robot. The robot cable is connected to the control box via the base module port board to supply power and data to the robot.

**Joint module**

The robot consists of 6 independent drive modules, which are die-case in aluminum.

## Electrical System

The electrical system consists of all the electrical components that powering and controlling each joint motor (including drives, connectors, cables and etc.).

### 3.2.2 Robot joint coordinates

Robot joint coordinate schemata as follows:

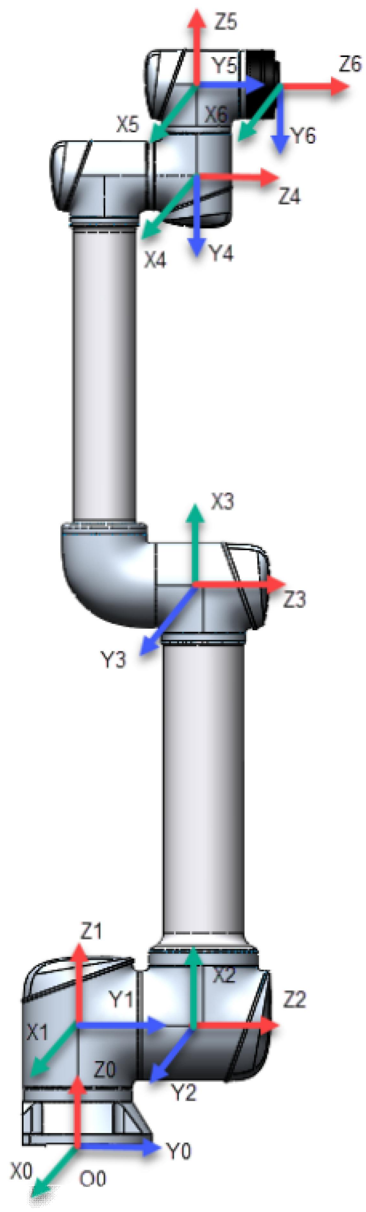



Figure 3- 3 Robot joint coordinate

### 3.2.3 Robot zero position and positive direction

Robot zero position and positive direction is illustrated as follows:

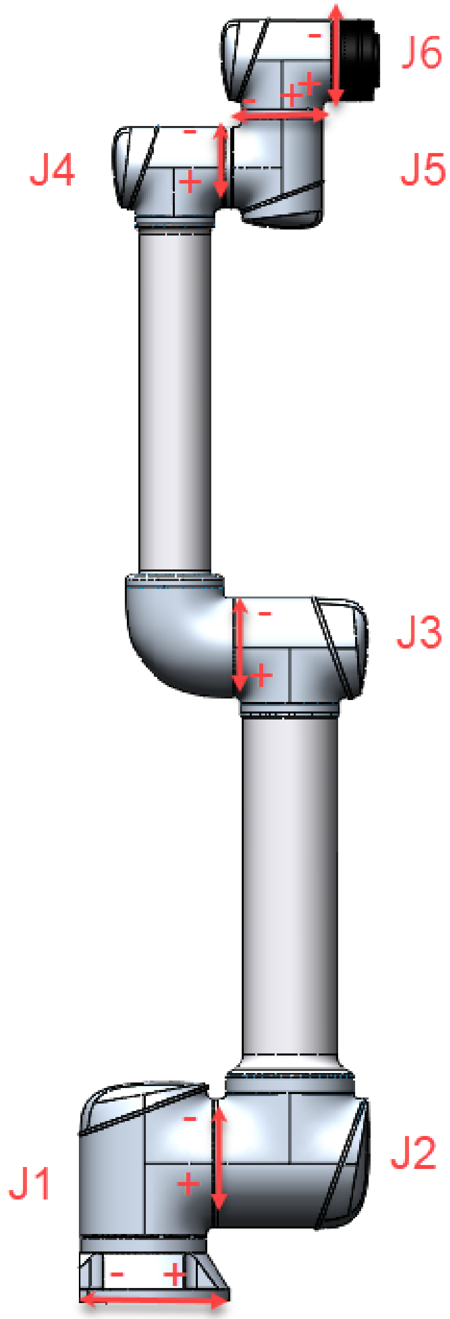
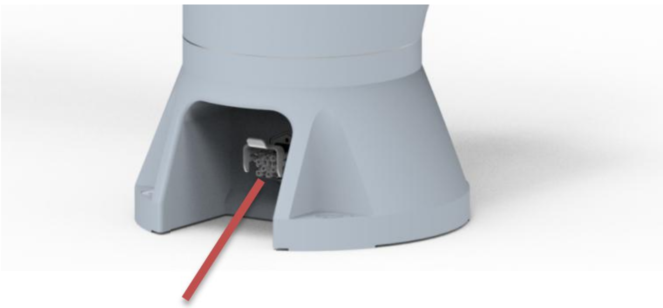



Figure 3- 4 Robot zero position and positive direction

### 3.2.4 Base Input Panel Description

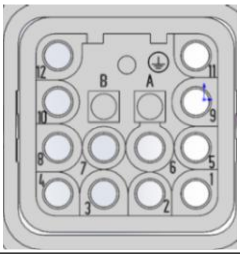


Functional port

Figure 3- 5 Base module schemata

The base input panel is located at the bottom of the robot and contains a functional port. Used to connect the cable between the plates, supply power to robots, transmit data, and connect gas lines. Base input panel includes the following functional ports:

The robot port definition is shown in follow figure:




| Connector No. | Signal Definition | Remarks |
|---|---|---|
| 9 | 48V | |
| 10 | 48V | |
| 11 | GND | |
| 12 | GND | |
| PE | PE | |
| 1 | EtherCAT Tx+ | |
| 2 | EtherCAT Tx- | |
| 3 | EtherCAT Rx+ | |
| 4 | EtherCAT Rx- | |

### 3.2.5 Tool Flange

The flange is on the end of robot, which follow GB/T14468.1-50-4-M6 or ISO 9409-1-50-4-M6 standard. There are mounting thread holes and pin holes for tools installation on the flange. The expansion I / O port and communicate port on the flange can be used for connecting tools.

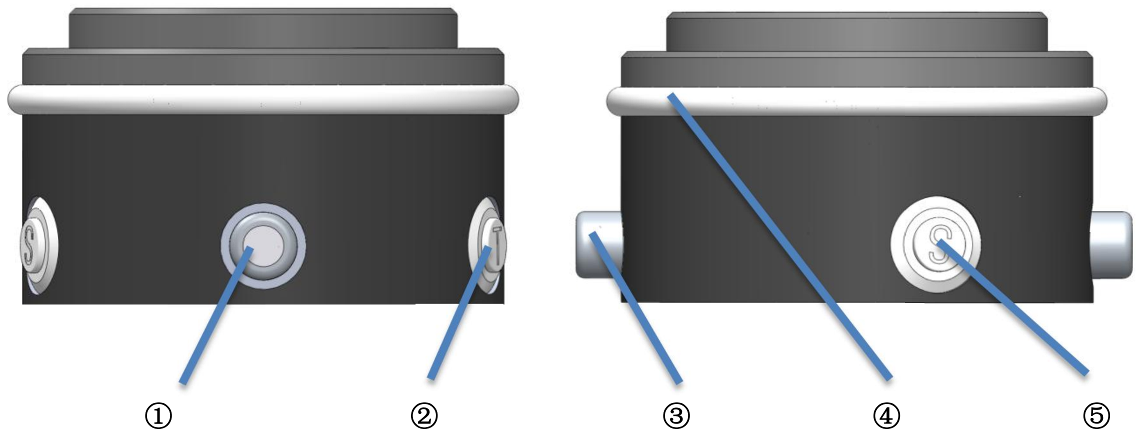


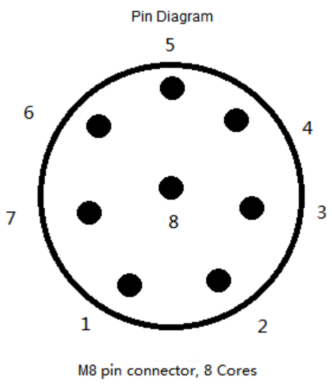

Figure 3- 6 Wrist flange schemata

| | |
|---|---|
| ① | Expansion I/O port |
| ② | Traction teaching button |
| ③ | Expansion communicate port |
| ④ | Status indicator LED |

| **Power output** | **DO（PNP&NPN）** | **DI（PNP）** |
|---|---|---|
| 24V,，max 1.2A | 2ch，24V， max.0.6A | 2ch，24V |

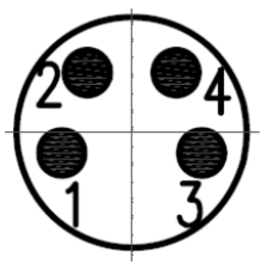
This connector provides power and control signals for grippers and sensors used on specific robotic tools, with the I / O signals shown below.

**Expanded tool I/O port**




| | |
|---|---|
| 1 | AI1/RS485A |
| 2 | AI2/RS485B |
| 3 | Tool IO digital input2（DO2） |
| 4 | Tool IO digital input1（DO1） |
| 5 | 24V |
| 6 | Tool IO digital output2（DO2） |
| 7 | Tool IO digital output1（DO1） |
| 8 | GND |

**Expansion communicate port**




| | |
|---|---|
| 1 | TX+ |
| 2 | TX− |
| 3 | RX+ |
| 4 | RX− |

| | |
|---|---|
| Care | ● **Tool IO and control box power are separated. The corresponding 24V and 0V (GND) must be separated as well. If there is need, for external and tool IO uses, please separate uses effectively by relays.** |

**Basic electrical parameters:**

2 digital output DO drive capability（24V 0.6A）

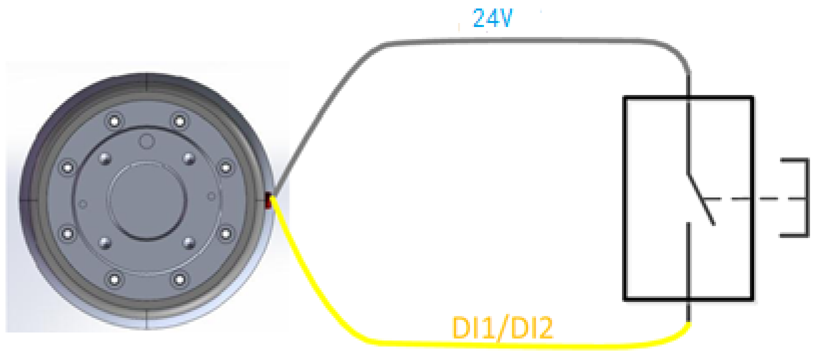
- It provides basic function for start and stop;

2 digital input DI

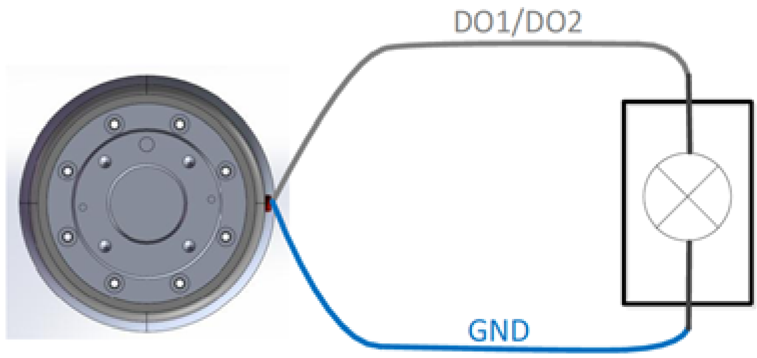
- It provides maximum 24V input signal

One 24V battery，maximum rate of power is 28.8W

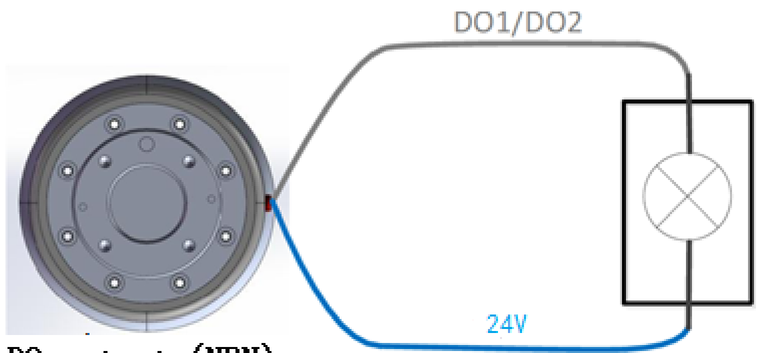
Tool I/O connecting method is illustrated below.




DI Input (PNP)




DO output (PNP)




DO output (NPN)

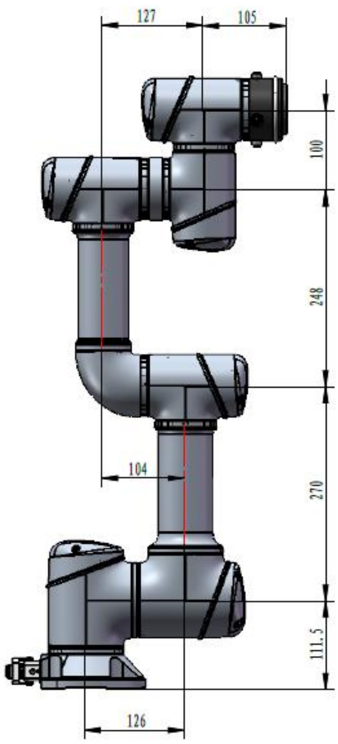
The indicator light described as follow:

| Description | Color | Image demo |
|---|---|---|
| 1.Robot power on<br>2.Standby | Constant blue |  |
| Error detected | Flashing red |  |
| 1.Running program<br>2.Robot 0 position<br>3.Manually move to any point<br>4.Collection detected | Constant green |  |
| Traction teach | Flashing green |  |
| Robot power on | Flashing white |  |

# 4 （1） X3-618

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th>Label</th><th colspan="3">Data</th></tr>
<tr><td>Load</td><td colspan="3">3kg</td></tr>
<tr><td>Degree of freedom</td><td colspan="3">6</td></tr>
<tr><td>Weight</td><td colspan="3">13kg</td></tr>
<tr><td>Workspace Radium</td><td colspan="3">618mm</td></tr>
<tr><td>Repeatability</td><td colspan="3">±0.02mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(° /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>225</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>Robot size</td><td colspan="3">769x315x150mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">532x431x330mm</td></tr>
<tr><td>Controller size</td><td colspan="3">410×306×292mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">480×395×376mm</td></tr>
<tr><td>Installation</td><td colspan="3">Vertical, Horizontal, Upside down</td></tr>
<tr><td>Surrounding temperature</td><td colspan="3">-10℃ ~45℃</td></tr>
<tr><td>Storage temperature</td><td colspan="3">-40℃~55℃</td></tr>
<tr><td>IP code</td><td colspan="3">IP54</td></tr>
<tr><td>lifetime</td><td colspan="3">35,000h</td></tr>
<tr><td>Noise</td><td colspan="3">≤75dB(A)</td></tr>
</table>

### 4.1.2 Working Space

The work space is as following:

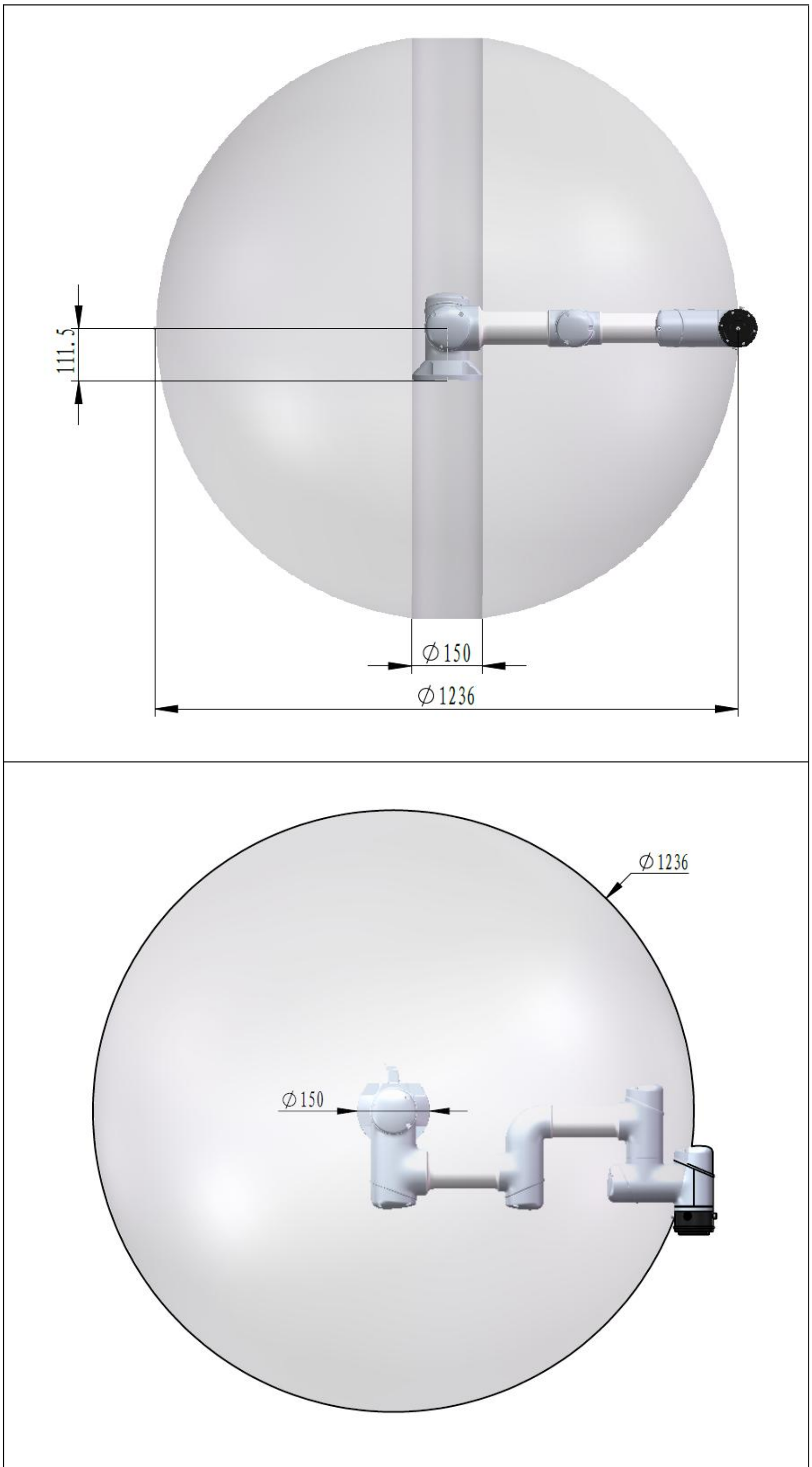



Figure 4- 1 Robot work space

# 4.2 Load

## 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 3kg |
| **J5 Moment of inertia allowance** | 0.5 $kgm^2$ |
| **J6 Moment of inertia allowance** | 0.2 $kgm^2$ |
| **Distance of load gravity center, Lxy** | 100mm |
| **Distance of load gravity center, Lz** | 330 mm |

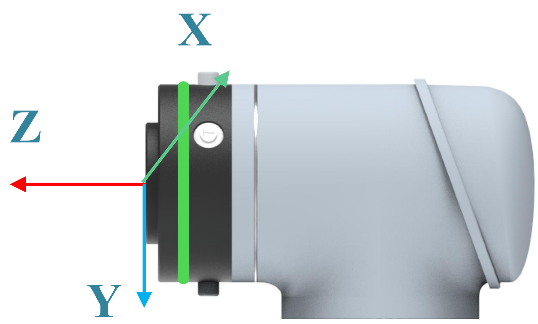
## 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | ● **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



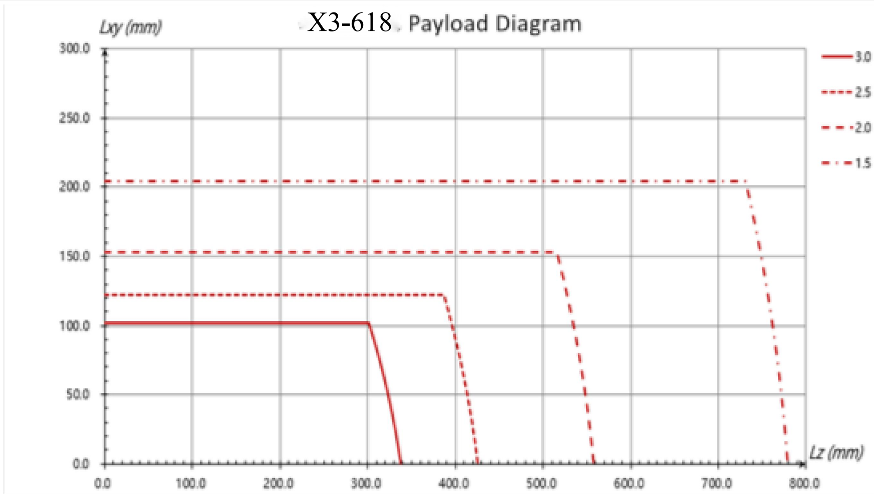




Figure 4- 2 Payload diagram

# 4.3 Stop time and distance

## 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

### 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 7.8627 | 232 |
| **A2** | 7.7872 | 264 |
| **A3** | 10.268 | 164 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.

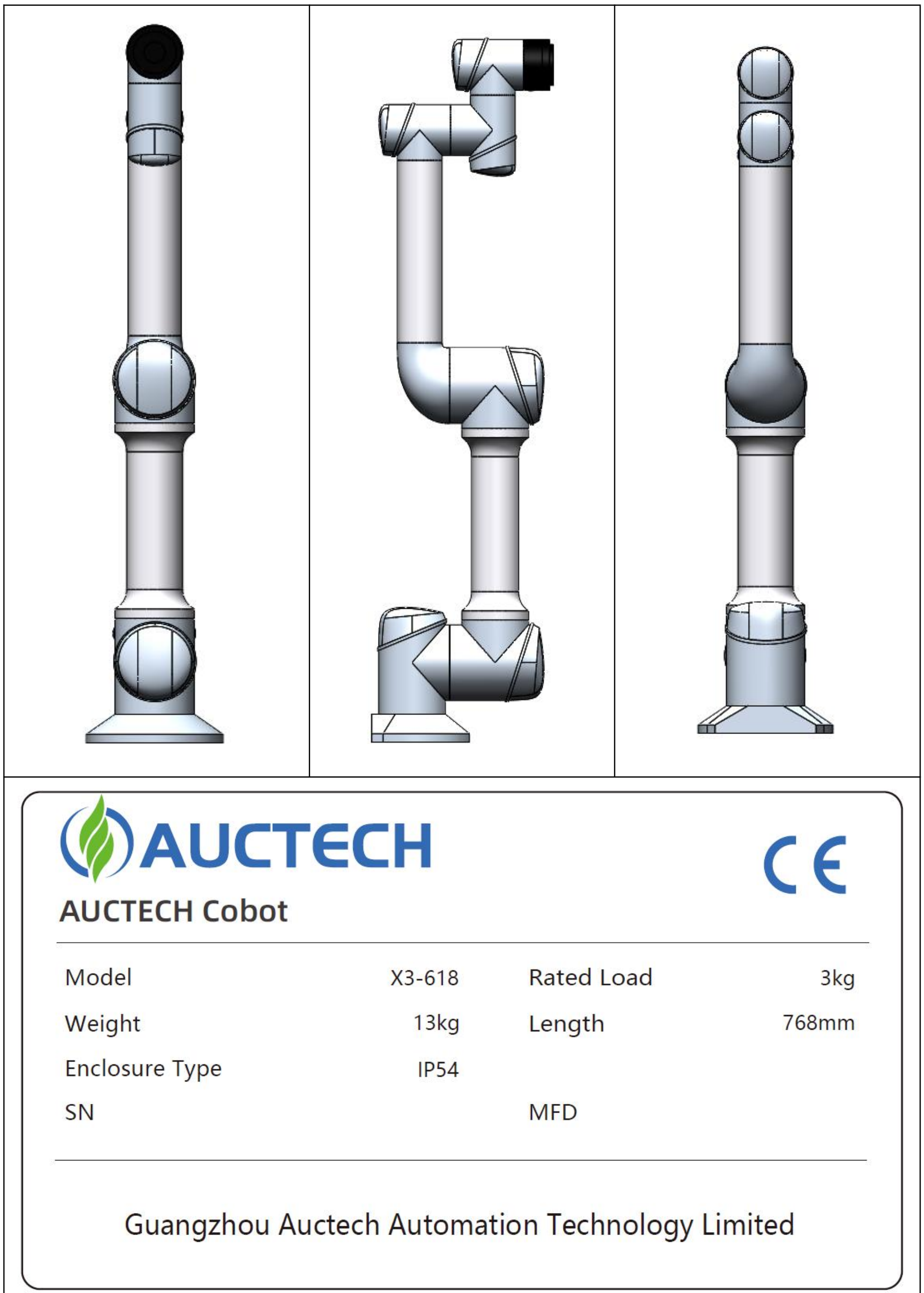
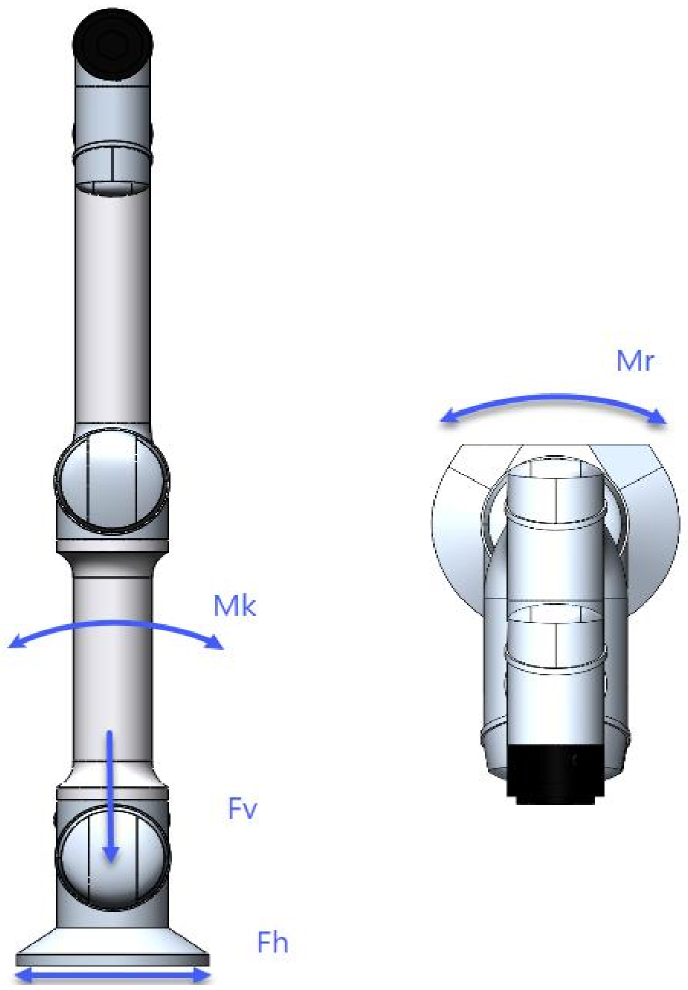



Figure 4- 3 Nameplates and labels

# 4.5 Mechanical Installation

## 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.




Front View    Top View

Figure 4- 4 Robot base installation

| Force type | Force/moment |
|---|---|
| **Vertical force, Fv** | 469 N |
| **Horizontal force, Fh** | 539 N |
| **Tilting moment, Mk** | 294 Nm |
| **Axis 1 moment, Mr** | 298 Nm |

| | |
|---|---|
| **Warning** | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

## 4.5.2 Base module Installation

The robot body is fixed by four M6 bolts through four 6.6mm screw holes on the base. 15N・m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base. The detailed information of installation holes on base is shown in the following figure.

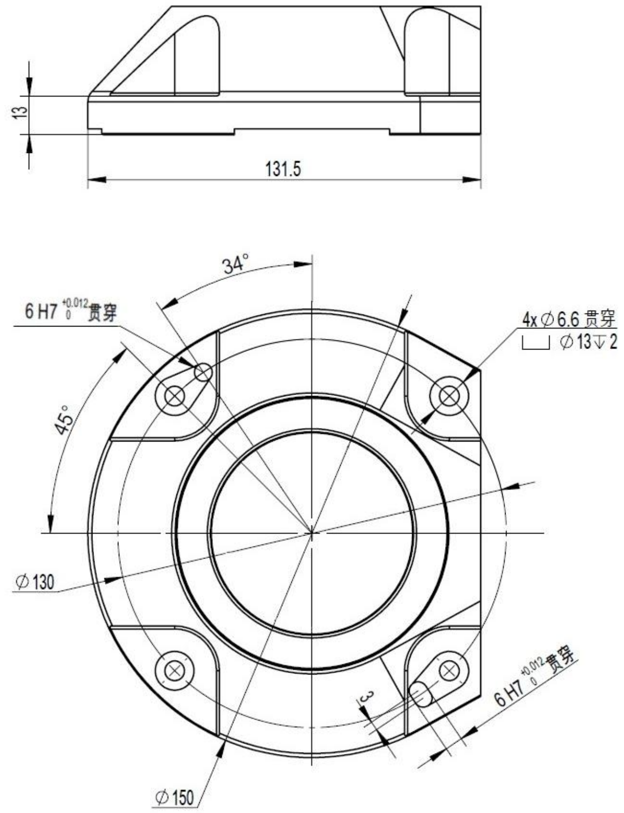



Figure 4- 5 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

### 4.5.3 Tool Flange Data

**Basic data**

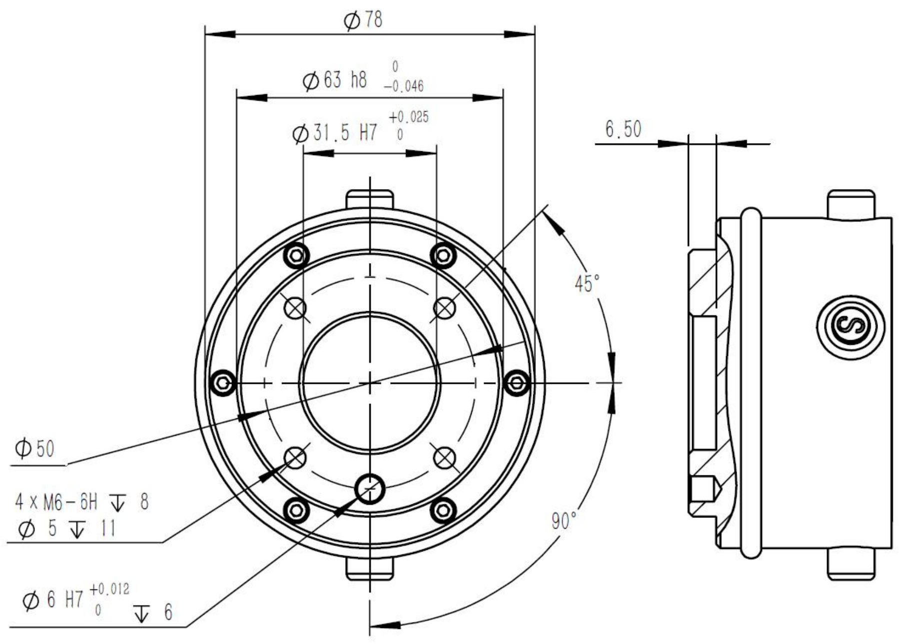



Figure 4- 6 Tool Flange

| | |
|---|---|
| **Load** | 3kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 10.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

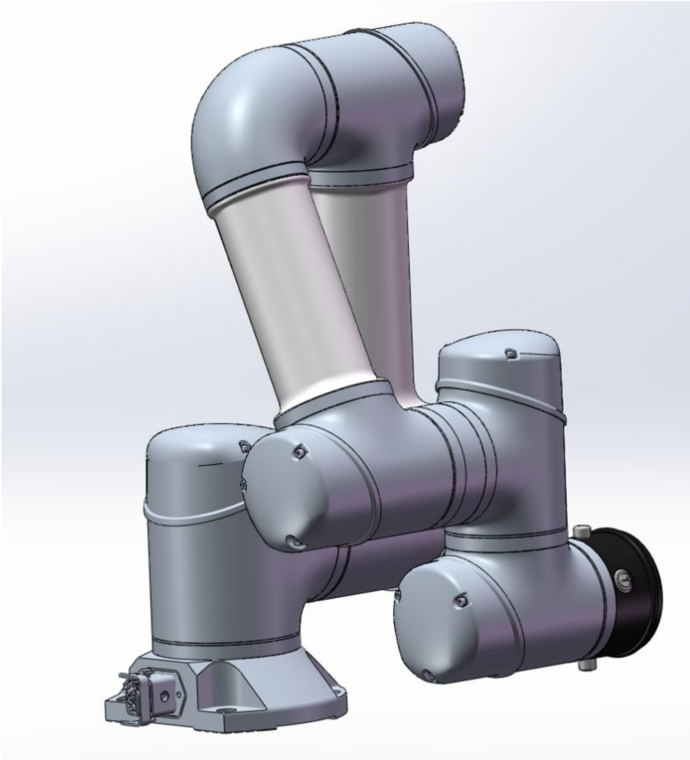
### 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| ⚠ Danger | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

## 4.5.5 Packaging Pose

Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:



| Joint | Angle（°） |
|---|---|
| **J6** | **0°** |
| **J5** | **0°** |
| **J4** | **25°** |
| **J3** | **155°** |
| **J2** | **0°** |
| **J1** | **0°** |

## 4.5.6 Packaging Size

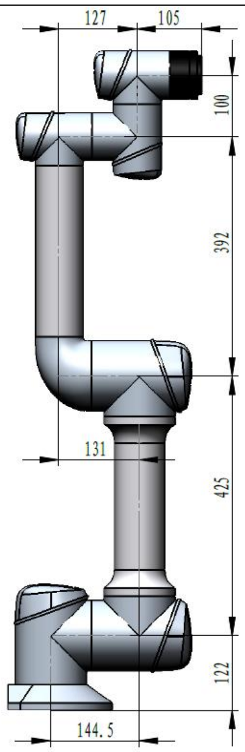
The packaging box size provided is as follows.

| |
|---|
|  |
| The reference dimension of mechanical arm box：532x431x330mm 18kg |
|  |
| DSC30D Packaging box size：480×395×376mm 19kg（DC15S-J9） |

# 4 （2）X5-910

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th colspan="2">Label</th><th colspan="2">Data</th></tr>
<tr><td colspan="2">Load</td><td colspan="2">5kg</td></tr>
<tr><td colspan="2">Degree of freedom</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Weight</td><td colspan="2">22kg</td></tr>
<tr><td colspan="2">Workspace Radium</td><td colspan="2">917mm</td></tr>
<tr><td colspan="2">Repeatability</td><td colspan="2">±0.02mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(° /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>225</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td colspan="2">Robot size</td><td colspan="2">1100 x 330 x 200 mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">698 x 588 x 450 mm</td></tr>
<tr><td colspan="2">Controller size</td><td colspan="2">410×306×292mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">480×395×376mm</td></tr>
<tr><td colspan="2">Installation</td><td colspan="2">Vertical, Horizontal, Upside down</td></tr>
<tr><td colspan="2">Surrounding temperature</td><td colspan="2">-10℃ ~45℃</td></tr>
<tr><td colspan="2">Storage temperature</td><td colspan="2">-40℃~55℃</td></tr>
<tr><td colspan="2">IP code</td><td colspan="2">IP54</td></tr>
<tr><td colspan="2">lifetime</td><td colspan="2">35,000h</td></tr>
<tr><td colspan="2">Noise</td><td colspan="2">≤75dB(A)</td></tr>
</table>

## 4.1.2 Working Space

The work space is as following:

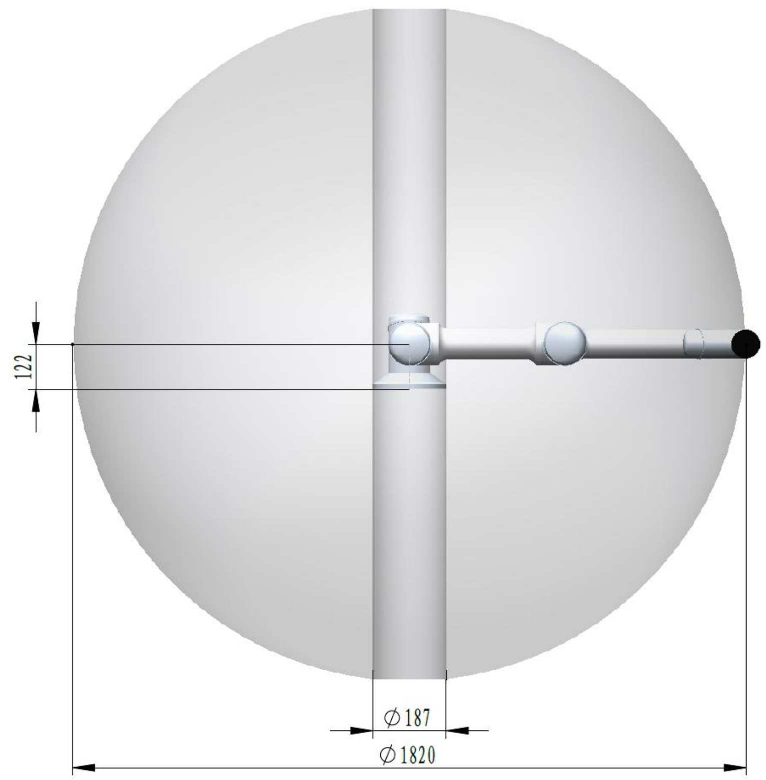



Figure 4- 1 Robot work space

## 4.2 Load

### 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 5 kg |
| **J5 Moment of inertia allowance** | 0.75 $kgm^2$ |
| **J6 Moment of inertia allowance** | 0.30 $kgm^2$ |
| **Distance of load gravity center, Lxy** | 122.4 mm |
| **Distance of load gravity center, Lz** | 156.1 mm |

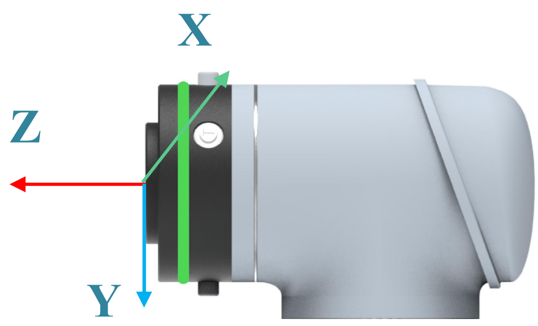
### 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| Care | |
|---|---|
| | ● **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



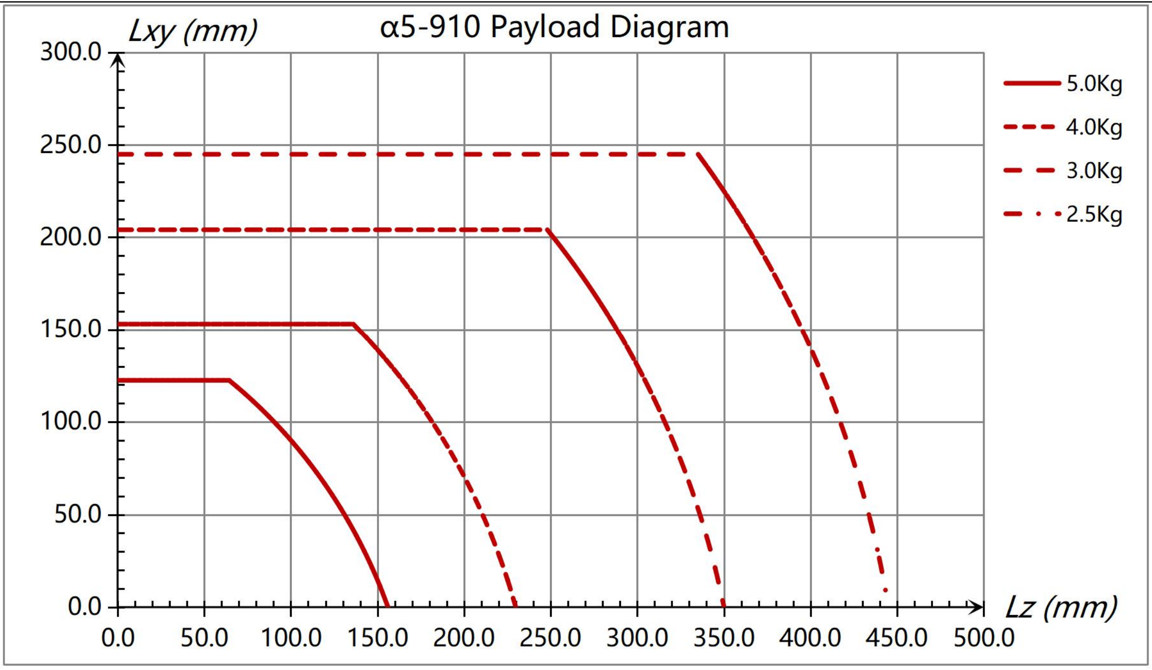




Figure 4- 2 Payload diagram

## 4.3 Stop time and distance

### 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

### 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 16.35 | 152 |
| **A2** | 21.37 | 164 |
| **A3** | 17.34 | 144 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.

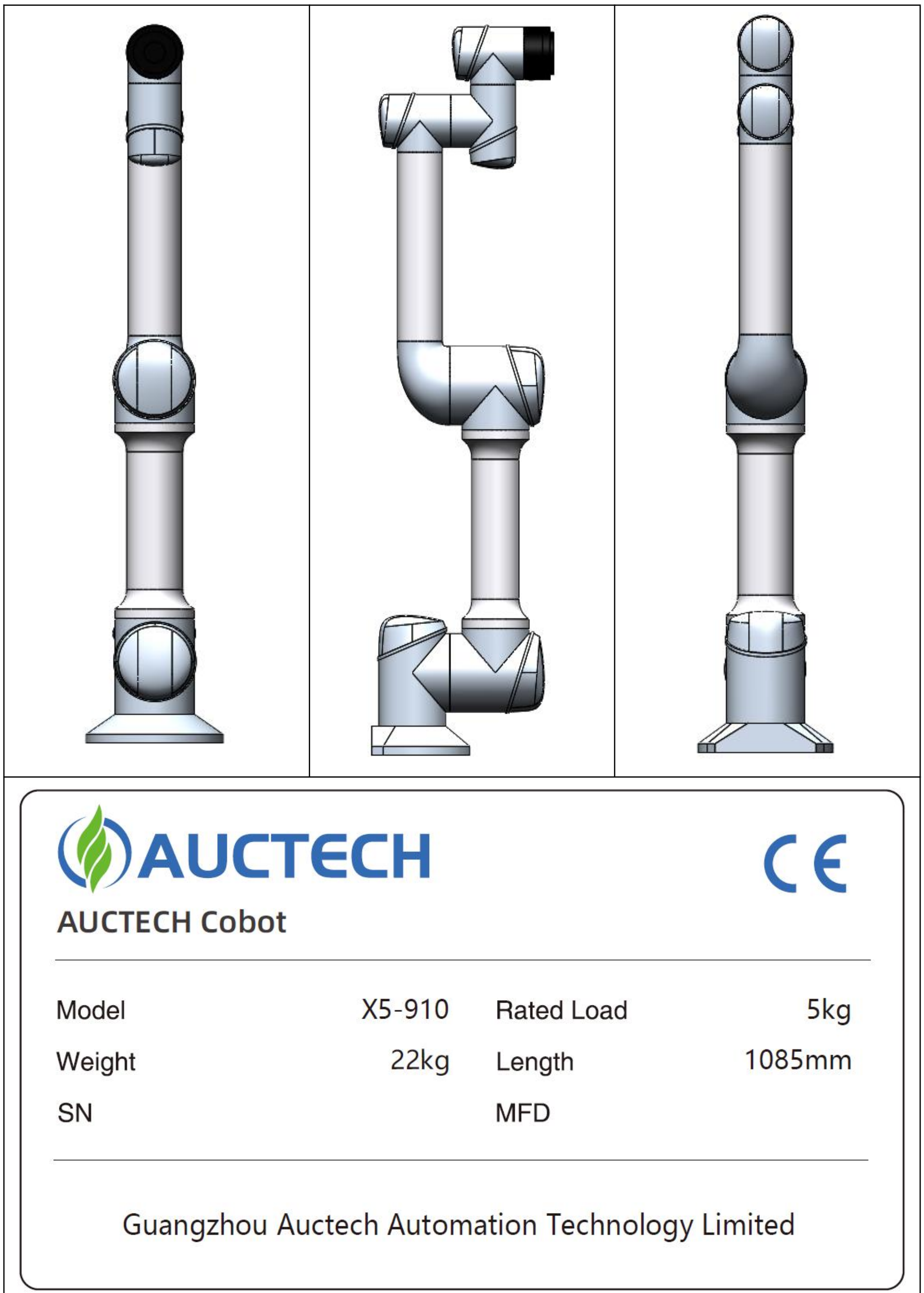
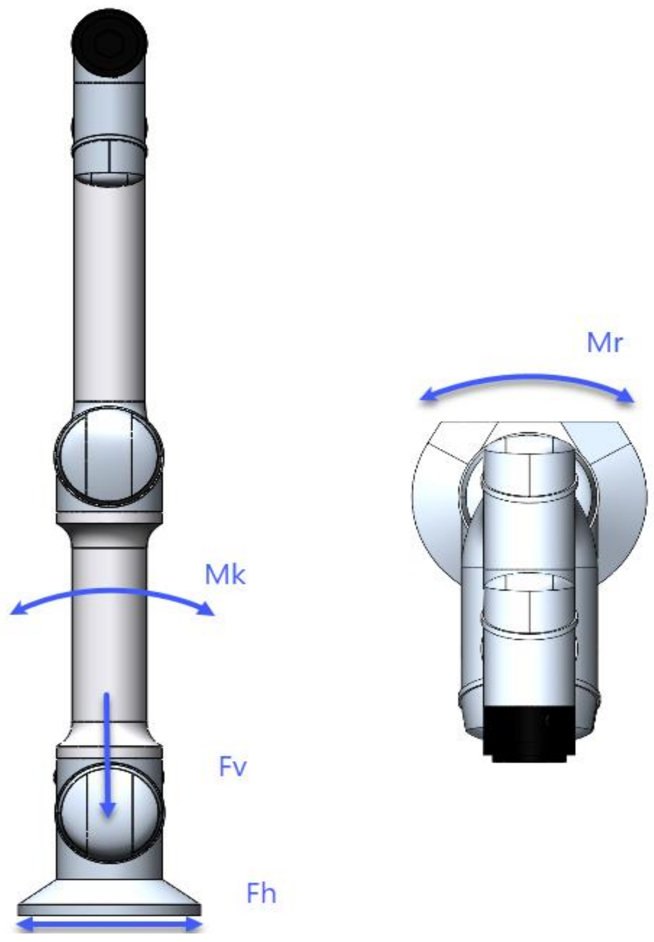



Figure 4- 3 Nameplates and labels

## 4.5 Mechanical Installation

### 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.




Front View Top View

Figure 4- 4 Robot base installation

| Force type | Force/moment |
|---|---|
| **Vertical force, Fv** | 469 N |
| **Horizontal force, Fh** | 539 N |
| **Tilting moment, Mk** | 294 Nm |
| **Axis 1 moment, Mr** | 298 Nm |

| | |
|---|---|
| Warning | **● The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

### 4.5.2 Base module Installation

The robot body is fixed by four M8 bolts through four 9mm screw holes on the base. 35N • m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base, if needed. The detailed information of installation holes on base is shown in the following figure.

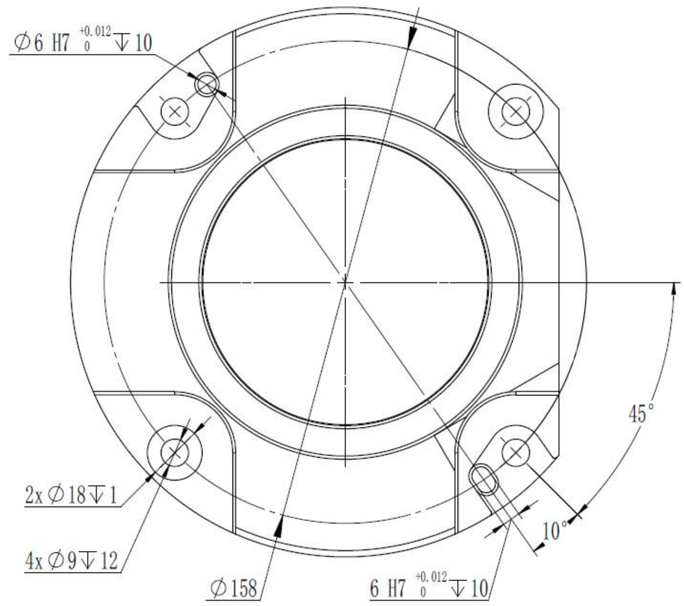



Figure 4- 5 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

### 4.5.3 Tool Flange Data

**Basic data**

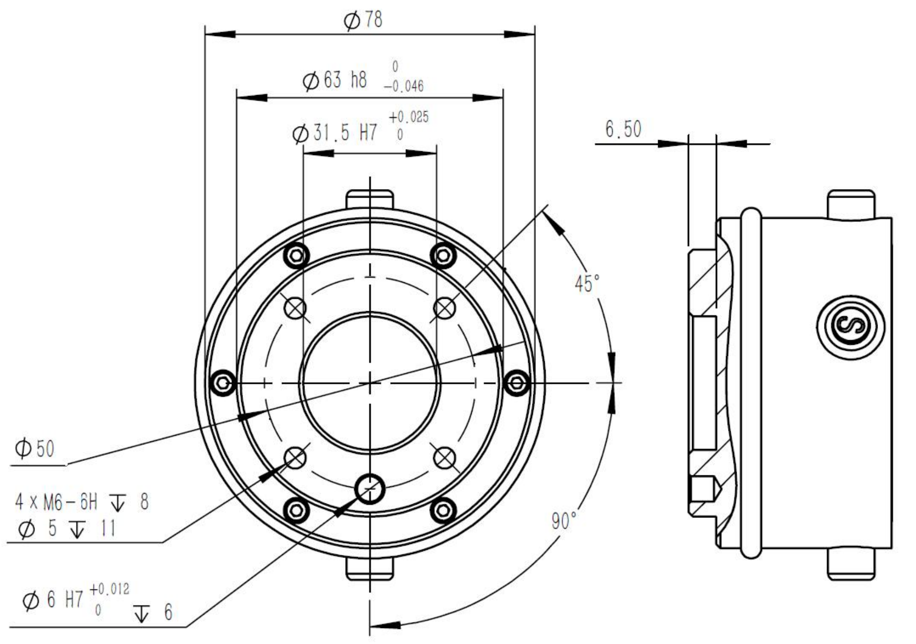



Figure 4- 6 Tool Flange

| | |
|---|---|
| **Load** | 5kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 10.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

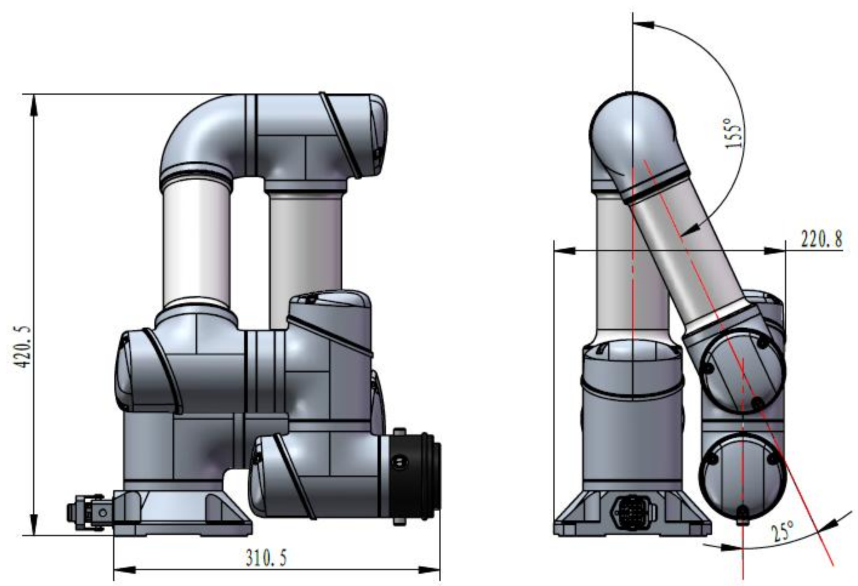
### 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| **Danger** | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

### 4.5.5 Packaging Pose

Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:




| Joint | Angle（°） |
|---|---|
| J6 | 0° |
| J5 | 0° |
| J4 | 25° |
| J3 | 155° |
| J2 | 0° |
| J1 | 0° |

### 4.5.6 Packaging Size

The packaging box size provided is as follows.

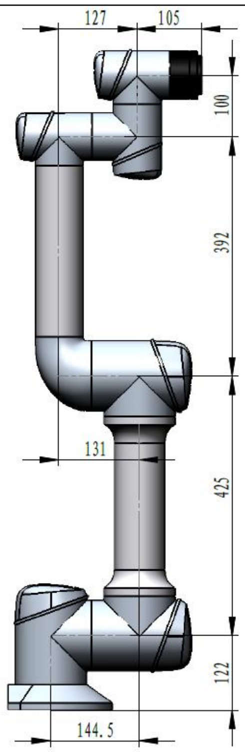
The reference dimension of mechanical arm：698 x 588 x 450mm 30kg

DSC30D Packaging box size： 480×395×376mm 19kg（DC15S-J9）

# 4 （3）X7-910

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th>Label</th><th colspan="3">Data</th></tr>
<tr><td>Load</td><td colspan="3">7kg</td></tr>
<tr><td>Degree of freedom</td><td colspan="3">6</td></tr>
<tr><td>Weight</td><td colspan="3">22kg</td></tr>
<tr><td>Workspace Radium</td><td colspan="3">917mm</td></tr>
<tr><td>Repeatability</td><td colspan="3">±0.02mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(° /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>225</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>200</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>200</td></tr>
<tr><td>Robot size</td><td colspan="3">1100 x 330 x 200 mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">698 x 588 x 450 mm</td></tr>
<tr><td>Controller size</td><td colspan="3">410×306×292mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">480×395×376mm</td></tr>
<tr><td>Installation</td><td colspan="3">Vertical, Horizontal, Upside down</td></tr>
<tr><td>Surrounding temperature</td><td colspan="3">-10℃ ~45℃</td></tr>
<tr><td>Storage temperature</td><td colspan="3">-40℃~55℃</td></tr>
<tr><td>IP code</td><td colspan="3">IP54</td></tr>
<tr><td>lifetime</td><td colspan="3">35,000h</td></tr>
<tr><td>Noise</td><td colspan="3">≤75dB(A)</td></tr>
</table>

## 4.1.2 Working Space

The work space is as following:

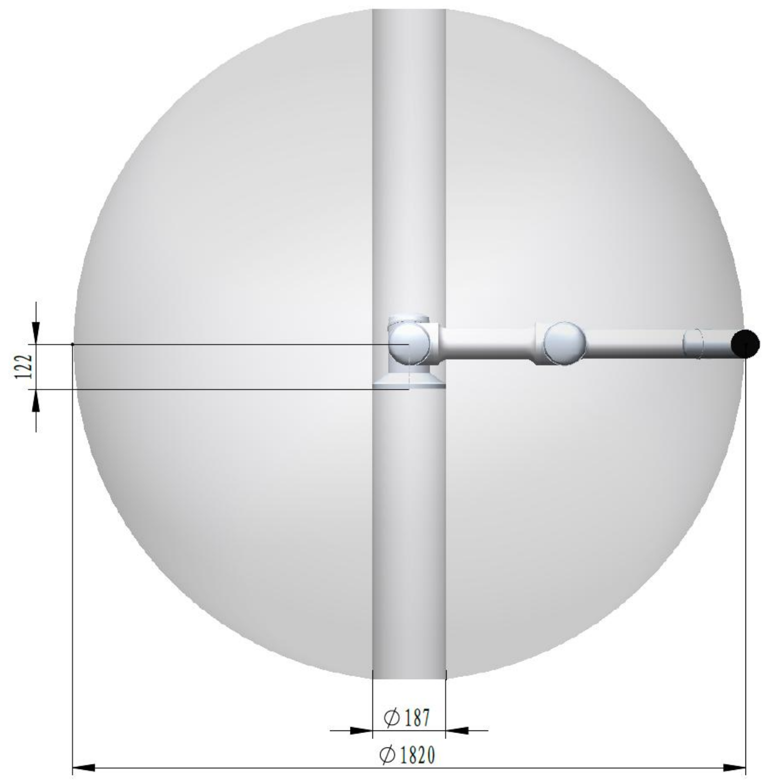



Figure 4- 1 Robot work space

# 4.2 Load

## 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 7kg |
| **J5 Moment of inertia allowance** | 0.75 $kgm^2$ |
| **J6 Moment of inertia allowance** | 0.30 $kgm^2$ |
| **Distance of load gravity center, Lxy** | 43.7 mm |
| **Distance of load gravity center, Lz** | 84.5 mm |

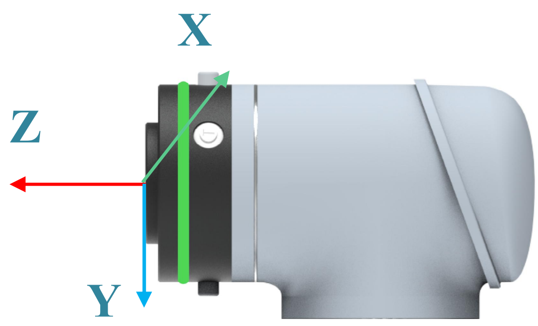
## 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | ● **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



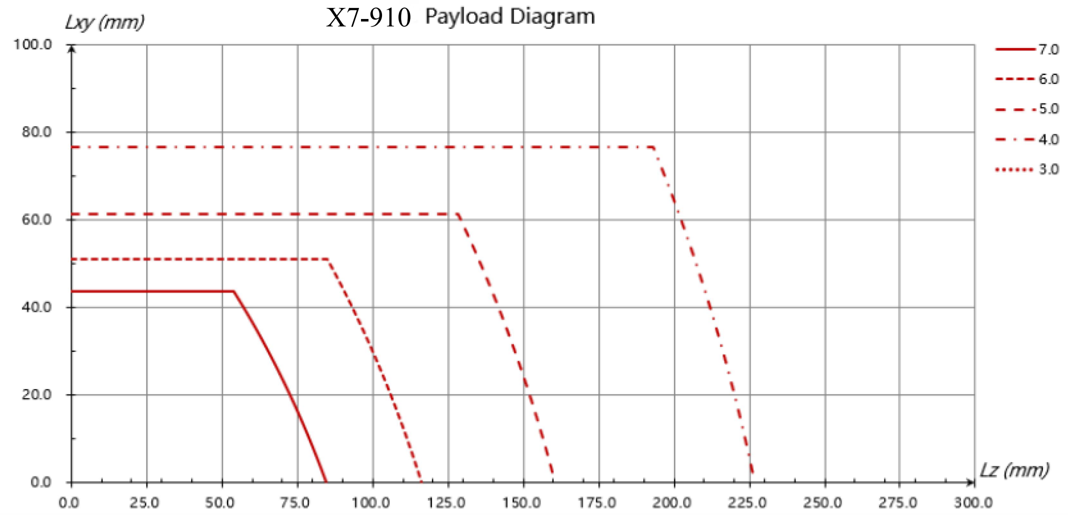




Figure 4- 2 Payload diagram

## 4.3 Stop time and distance

### 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

## 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 16.35 | 152 |
| **A2** | 21.37 | 164 |
| **A3** | 17.34 | 144 |

# 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.

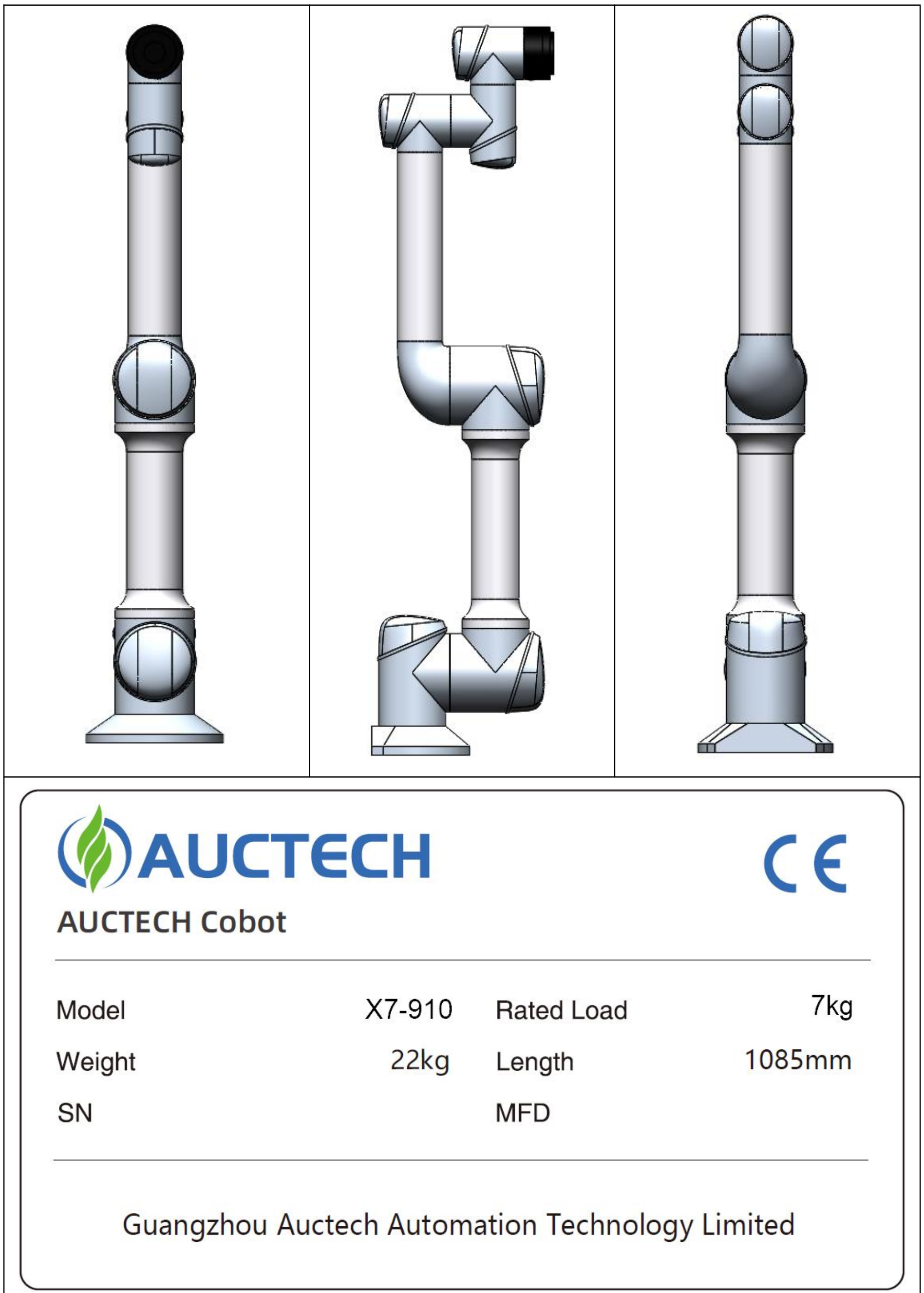
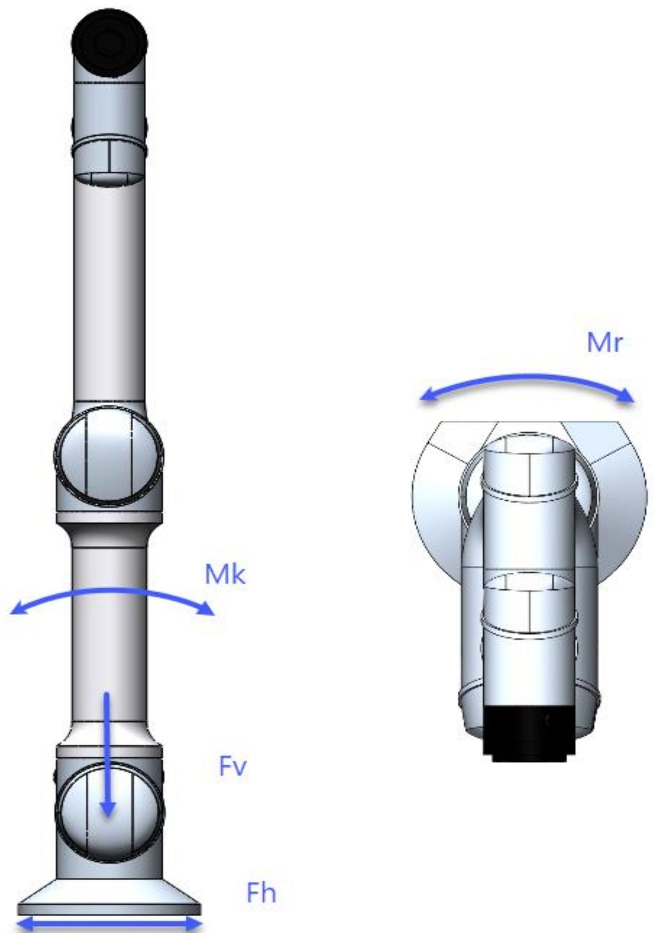



Figure 4- 3 Nameplates and labels

# 4.5 Mechanical Installation

## 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.




Front View Top View

Figure 4- 4 Robot base installation

| Force type | Force/moment |
|---|---|
| **Vertical force, Fv** | 469 N |
| **Horizontal force, Fh** | 539 N |
| **Tilting moment, Mk** | 294 Nm |
| **Axis 1 moment, Mr** | 298 Nm |

| | |
|---|---|
| ⚠Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

## 4.5.2 Base module Installation

The robot body is fixed by four M8 bolts through four 9mm screw holes on the base. 35N • m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base, if needed. The detailed information of installation holes on base is shown in the following figure.

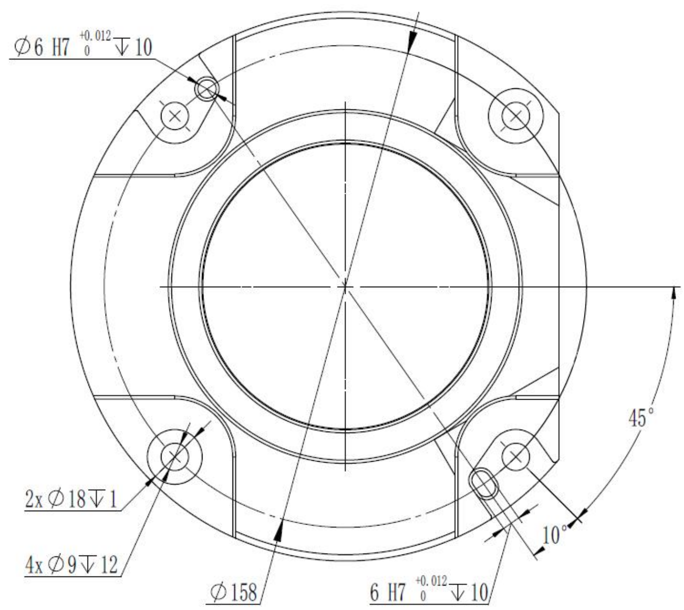



Figure 4- 5 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| ⚠ Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

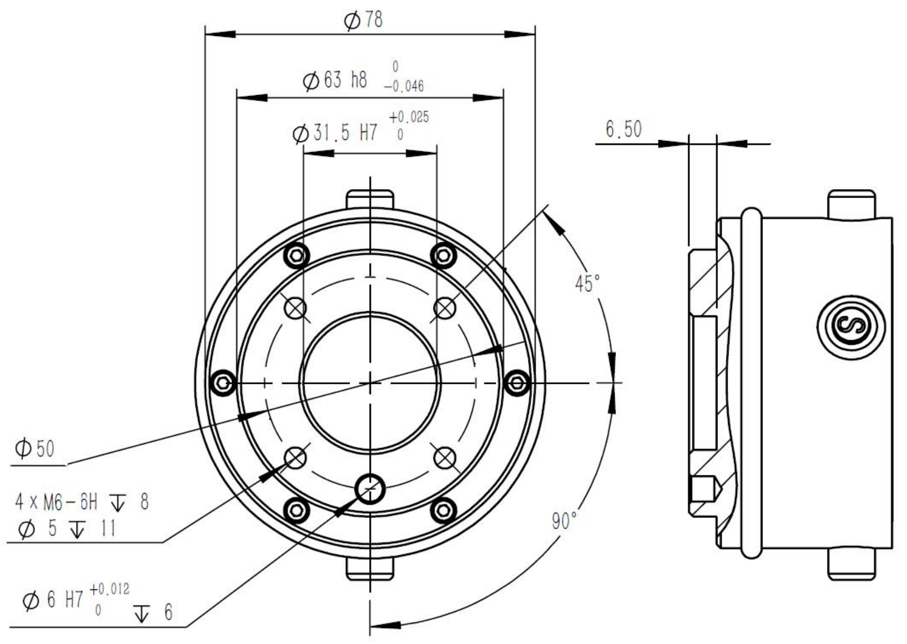



Figure 4- 6 Tool Flange

| | |
|---|---|
| **Load** | 7kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 10.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

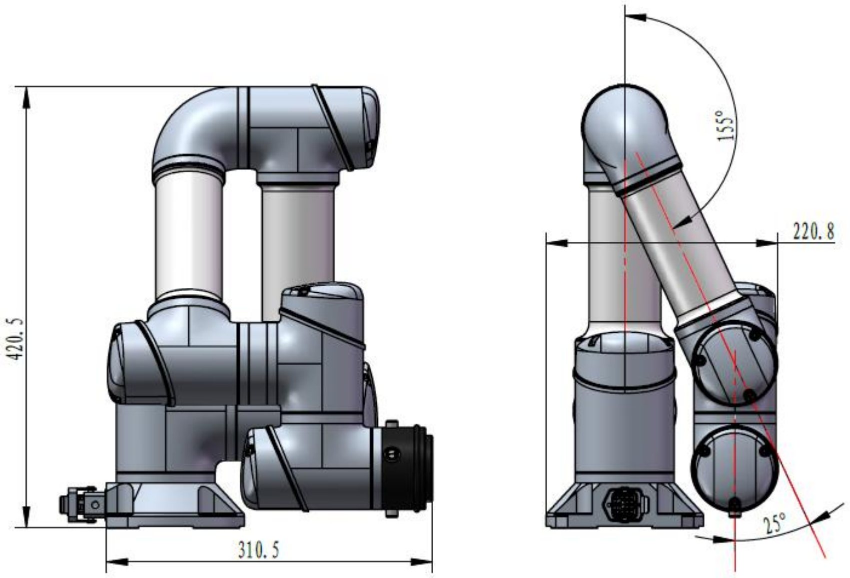
## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| ⚠ Danger | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

### 4.5.5 Packaging Pose

Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:




| Joint | Angle（°） |
|---|---|
| J6 | 0° |
| J5 | 0° |
| J4 | 25° |
| J3 | 155° |
| J2 | 0° |
| J1 | 0° |

### 4.5.6 Packaging Size

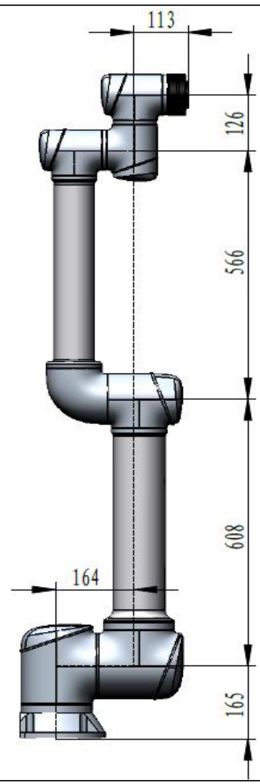
The packaging box size provided is as follows.

| |
|---|
|  |
| The reference dimension of mechanical arm：698 x 588 x 450mm 30kg |
|  |
| DSC30D Packaging box size： 480×395×376mm 19kg（DC15S-J9） |

# 4 （4）X10-1300

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th colspan="2">Label</th><th colspan="2">Data</th></tr>
<tr><td colspan="2">Load</td><td colspan="2">10kg</td></tr>
<tr><td colspan="2">Degree of freedom</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Weight</td><td colspan="2">37.8kg</td></tr>
<tr><td colspan="2">Workspace Radium</td><td colspan="2">1300mm</td></tr>
<tr><td colspan="2">Repeatability</td><td colspan="2">±0.03mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(° /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>225</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>180</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>180</td></tr>
<tr><td colspan="2">Robot size</td><td colspan="2">1512x 388x 205mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">952x509x516mm</td></tr>
<tr><td colspan="2">Controller size</td><td colspan="2">410×306×292mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">480×395×376mm</td></tr>
<tr><td colspan="2">Installation</td><td colspan="2">Vertical, Horizontal, Upside down</td></tr>
<tr><td colspan="2">Surrounding temperature</td><td colspan="2">-10℃ ~45℃</td></tr>
<tr><td colspan="2">Storage temperature</td><td colspan="2">-40℃~55℃</td></tr>
<tr><td colspan="2">IP code</td><td colspan="2">IP54</td></tr>
<tr><td colspan="2">lifetime</td><td colspan="2">35,000h</td></tr>
<tr><td colspan="2">Noise</td><td colspan="2">≤75dB(A)</td></tr>
</table>

### 4.1.2 Working Space

The work space is as following:

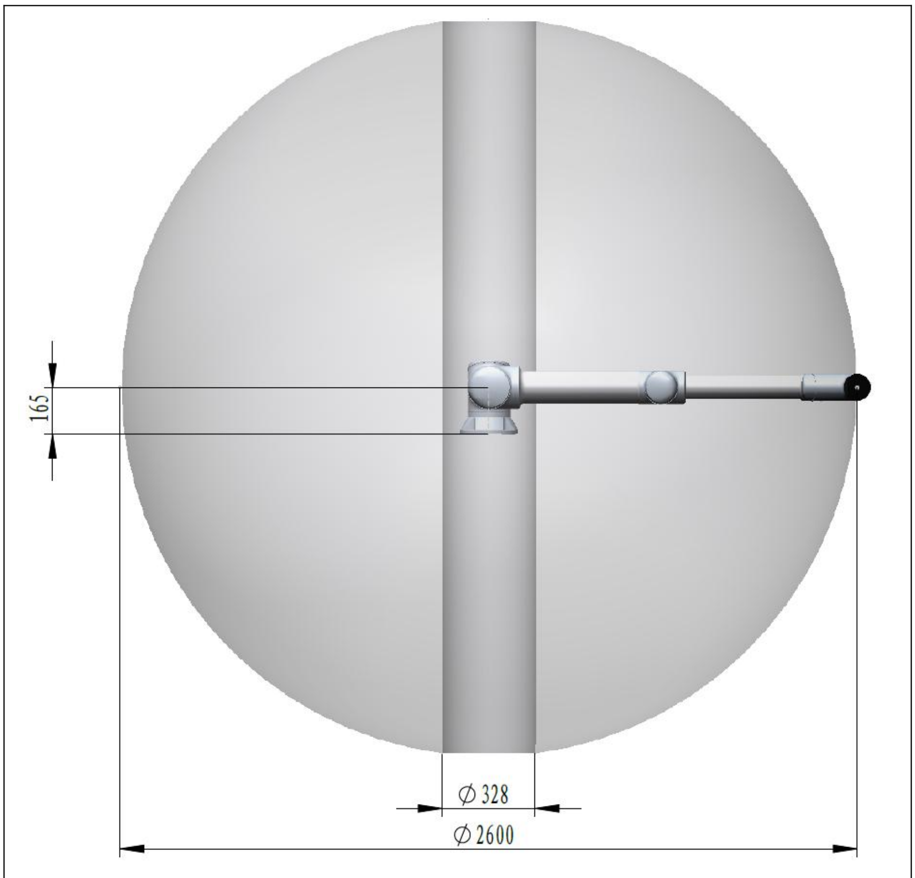



Figure 4- 1 Robot work space

# 4.2 Load

## 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 10kg |
| **J5 Moment of inertia allowance** | $2.14kgm^2$ |
| **J6 Moment of inertia allowance** | $1.28kgm^2$ |
| **Distance of load gravity center, Lxy** | 122.4mm |
| **Distance of load gravity center, Lz** | 169.9mm |

## 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | • **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.

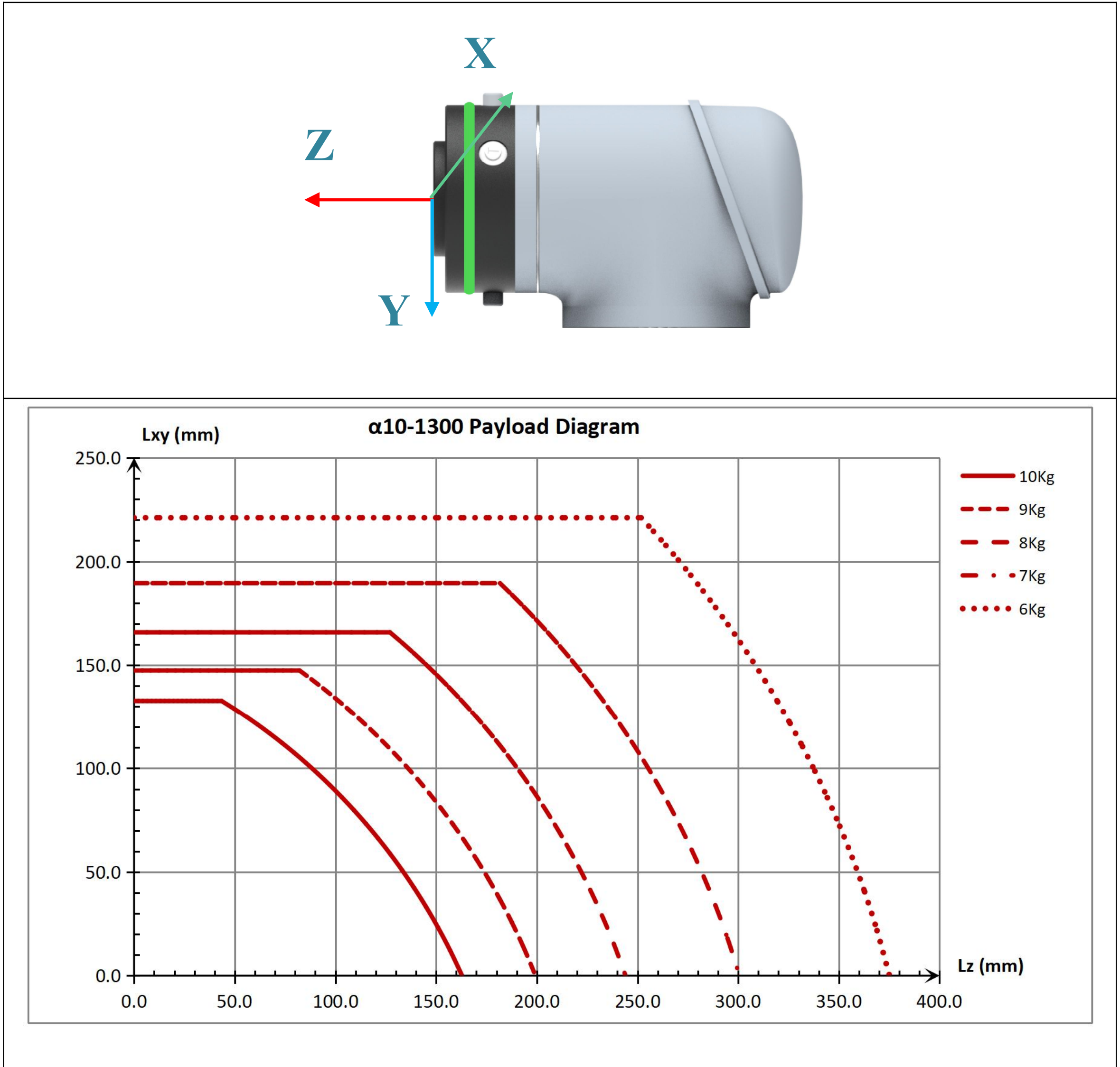



Figure 4- 2 Payload diagram

## 4.3 Stop time and distance

### 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

## 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

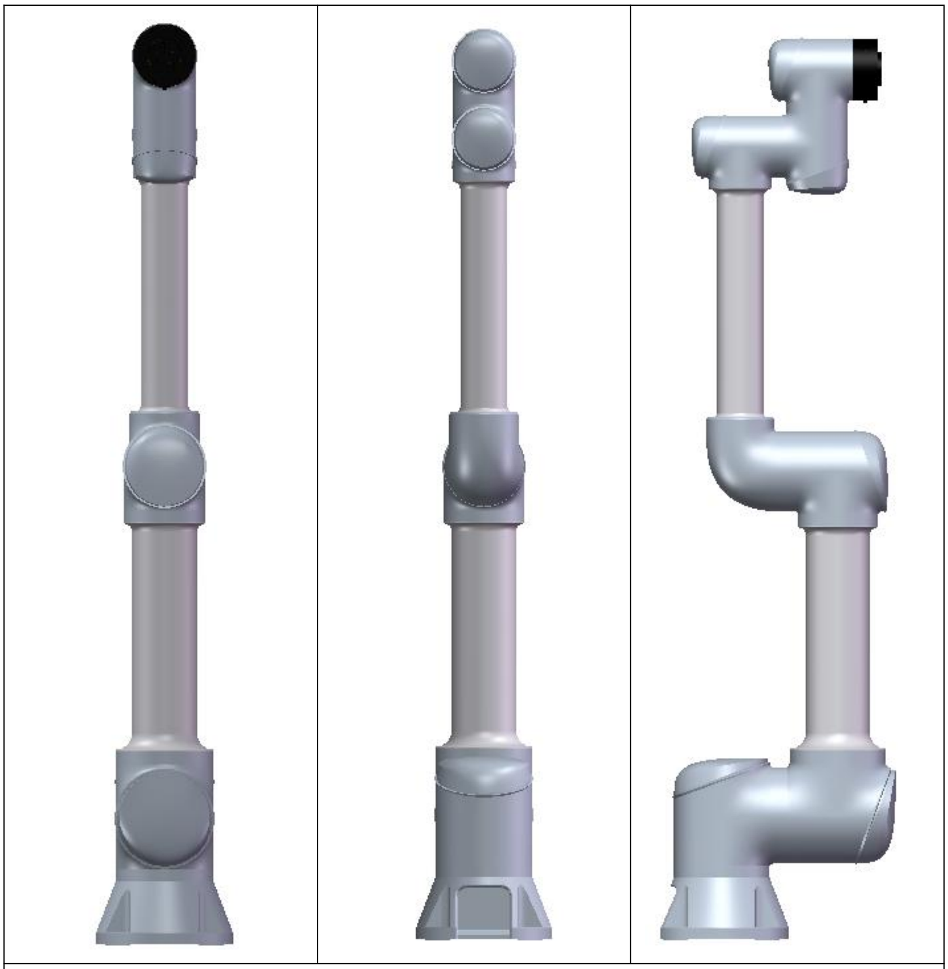
The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
| --- | --- | --- |
| **A1** | 9.926 | 228 |
| **A2** | 12.766 | 196 |
| **A3** | 10.268 | 164 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.



AUCTECH

CE

**AUCTECH Cobot**

| | | | |
|---|---|---|---|
| Model | X10-1300 | Rated Load | 10kg |
| Weight | 37.8kg | Length | 1512mm |
| Enclosure Type | IP54 | | |
| SN | | MFD | |

Guangzhou Auctech Automation Technology Limited

Figure 4- 3 Nameplates and labels

# 4.5 Mechanical Installation

## 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.

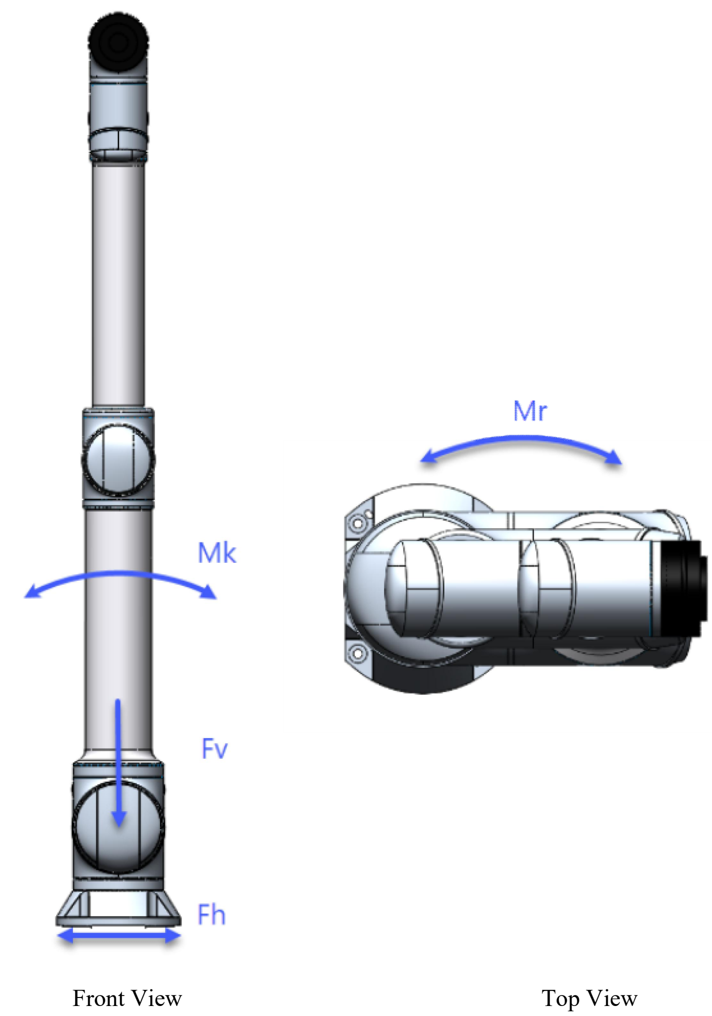



Figure 4- 4 Robot base installation

| Force type | Force/moment |
|---|---|
| **Vertical force, Fv** | 730 N |
| **Horizontal force, Fh** | 310 N |
| **Tilting moment, Mk** | 630 Nm |
| **Axis 1 moment, Mr** | 357 Nm |

| Warning | |
|---|---|
| Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

### 4.5.2 Base module Installation

The robot body is fixed by four M8 bolts through four 9mm screw holes on the base. 35N・m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base, if needed. The detailed information of installation holes on base is shown in the following figure.

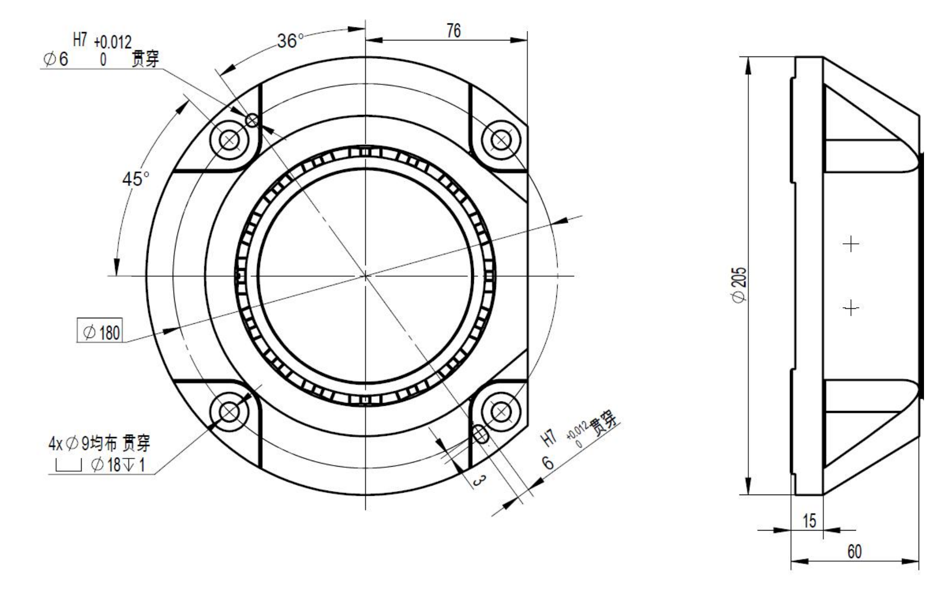



Figure 4- 5 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| ⚠ Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

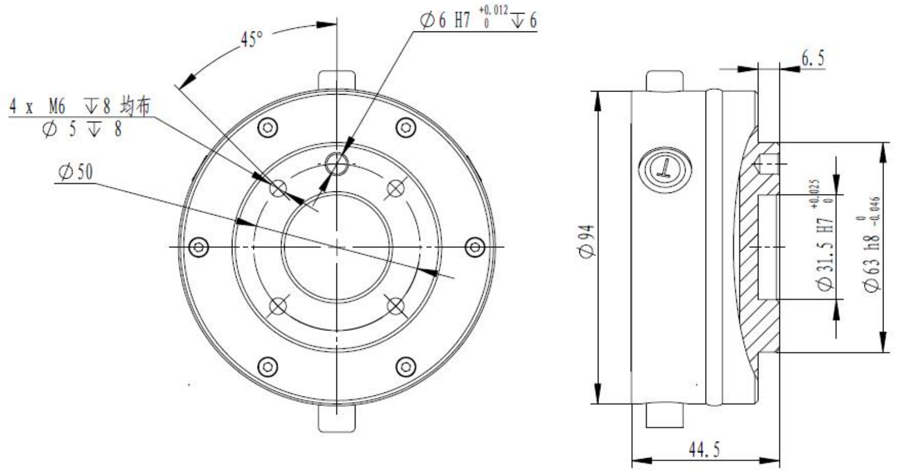



Figure 4- 6 Tool Flange

| | |
|---|---|
| **Load** | 10 kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 12.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

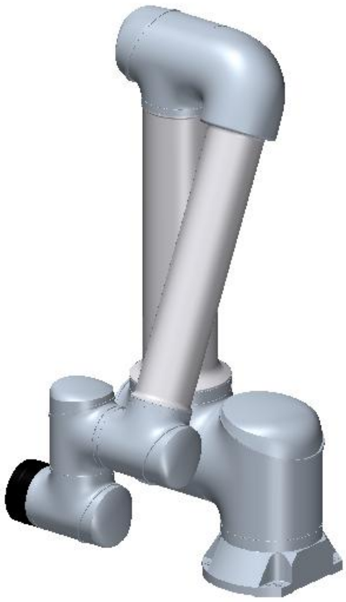
## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| ⚠ Danger | • **Make sure to select correct tools and the robot has been fully installed.**<br>• **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

### 4.5.5 Packaging Pose

Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:



| Joint | Angle（°） |
|---|---|
| J6 | 0° |
| J5 | 0° |
| J4 | -25° |
| J3 | -155° |
| J2 | 0° |
| J1 | 0° |

## 4.5.6 Packaging Size

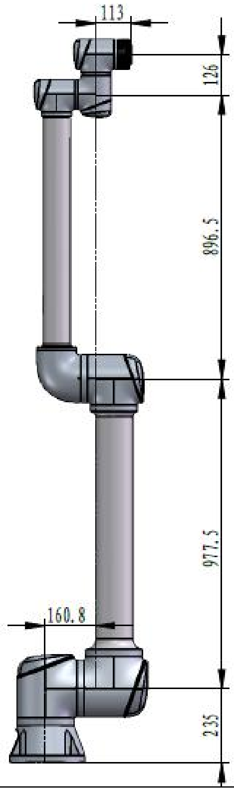
The packaging box size provided is as follows.

| |
|---|
|  |
| The reference dimension of mechanical arm：952×509×516 mm 46kg |
|  |
| DSC30D Packaging box size： 480×395×376mm 20kg（D30D-J9） |

# 4 （5）X10-2000

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th colspan="2">Label</th><th colspan="2">Data</th></tr>
<tr><td colspan="2">Load</td><td colspan="2">10kg</td></tr>
<tr><td colspan="2">Degree of freedom</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Weight</td><td colspan="2">58kg</td></tr>
<tr><td colspan="2">Workspace Radium</td><td colspan="2">2000mm</td></tr>
<tr><td colspan="2">Repeatability</td><td colspan="2">±0.05mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(° /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>180</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>120</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>120</td></tr>
<tr><td colspan="2">Robot size</td><td colspan="2">2300 x 388x 205mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">1465x516x472mm</td></tr>
<tr><td colspan="2">Controller size</td><td colspan="2">410×306×292mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">480×395×376mm</td></tr>
<tr><td colspan="2">Installation</td><td colspan="2">Vertical, Horizontal, Upside down</td></tr>
<tr><td colspan="2">Surrounding temperature</td><td colspan="2">-10℃ ~45℃</td></tr>
<tr><td colspan="2">Storage temperature</td><td colspan="2">-40℃~55℃</td></tr>
<tr><td colspan="2">IP code</td><td colspan="2">IP54</td></tr>
<tr><td colspan="2">lifetime</td><td colspan="2">35,000h</td></tr>
<tr><td colspan="2">Noise</td><td colspan="2">≤75dB(A)</td></tr>
</table>

### 4.1.2 Working Space

The work space is as following:

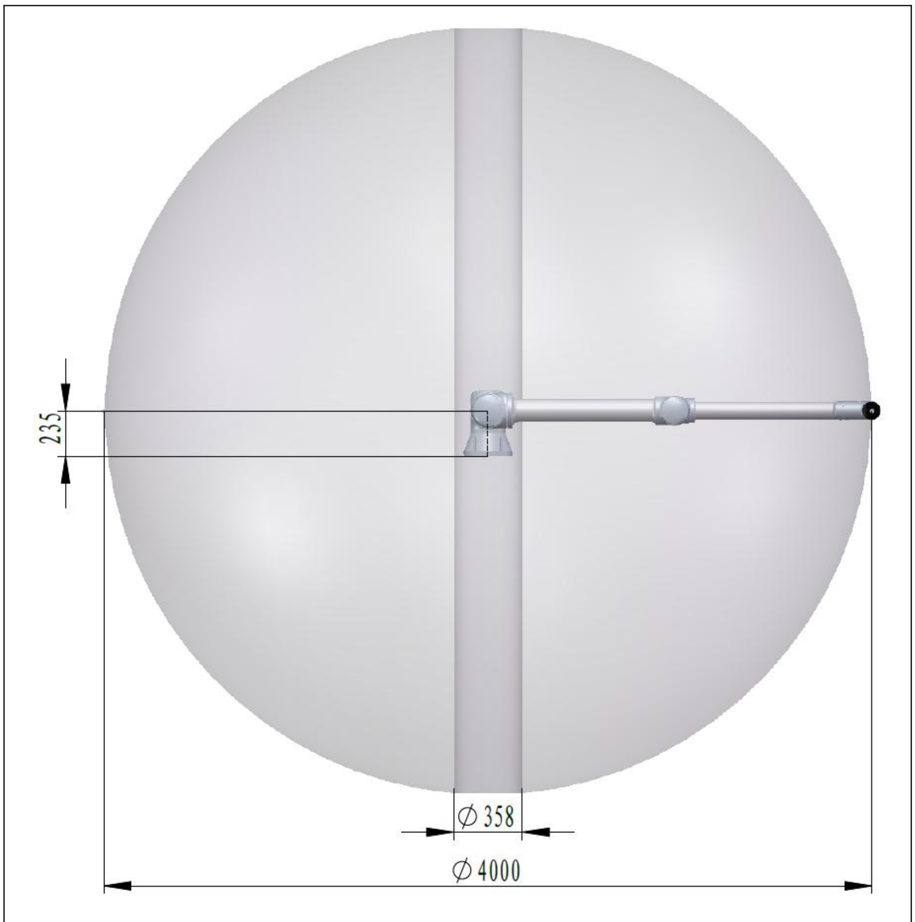



Figure 4- 1 Robot work space

## 4.2 Load

### 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 10kg |
| **J5 Moment of inertia allowance** | 2.14kgm² |
| **J6 Moment of inertia allowance** | 1.28kgm² |
| **Distance of load gravity center, Lxy** | 131.81mm |
| **Distance of load gravity center, Lz** | 160.05mm |

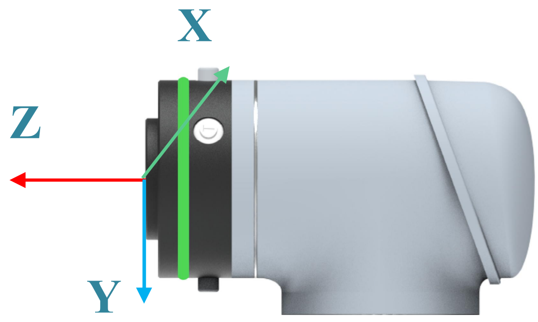
### 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | • **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



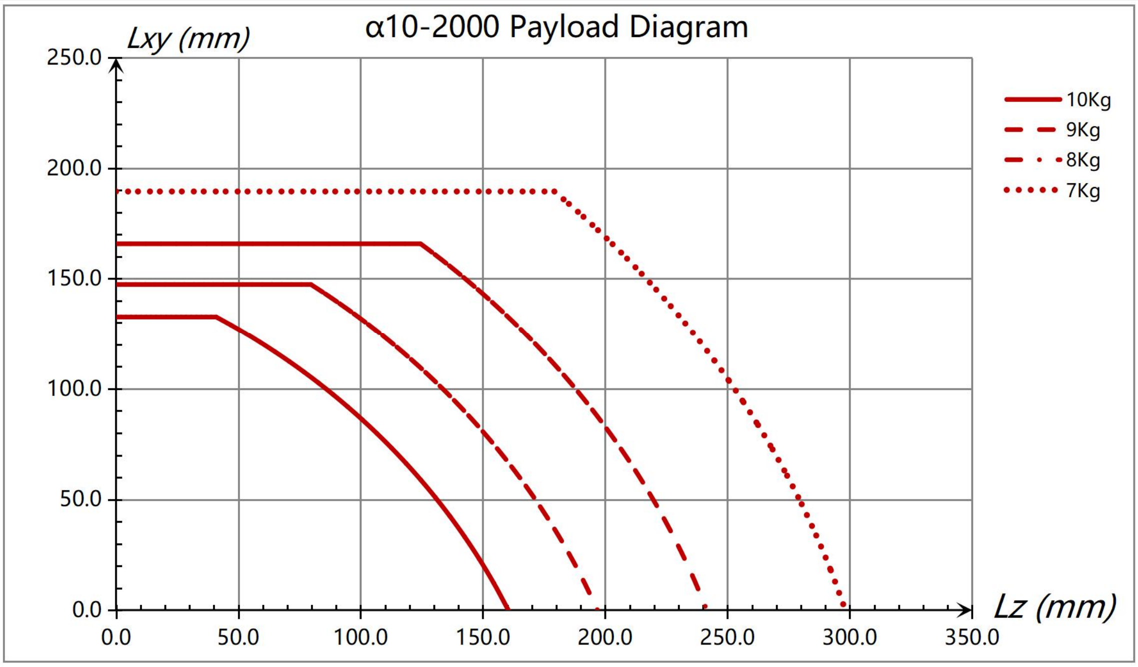




Figure 4- 2 Payload diagram

# 4.3 Stop time and distance

## 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

## 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

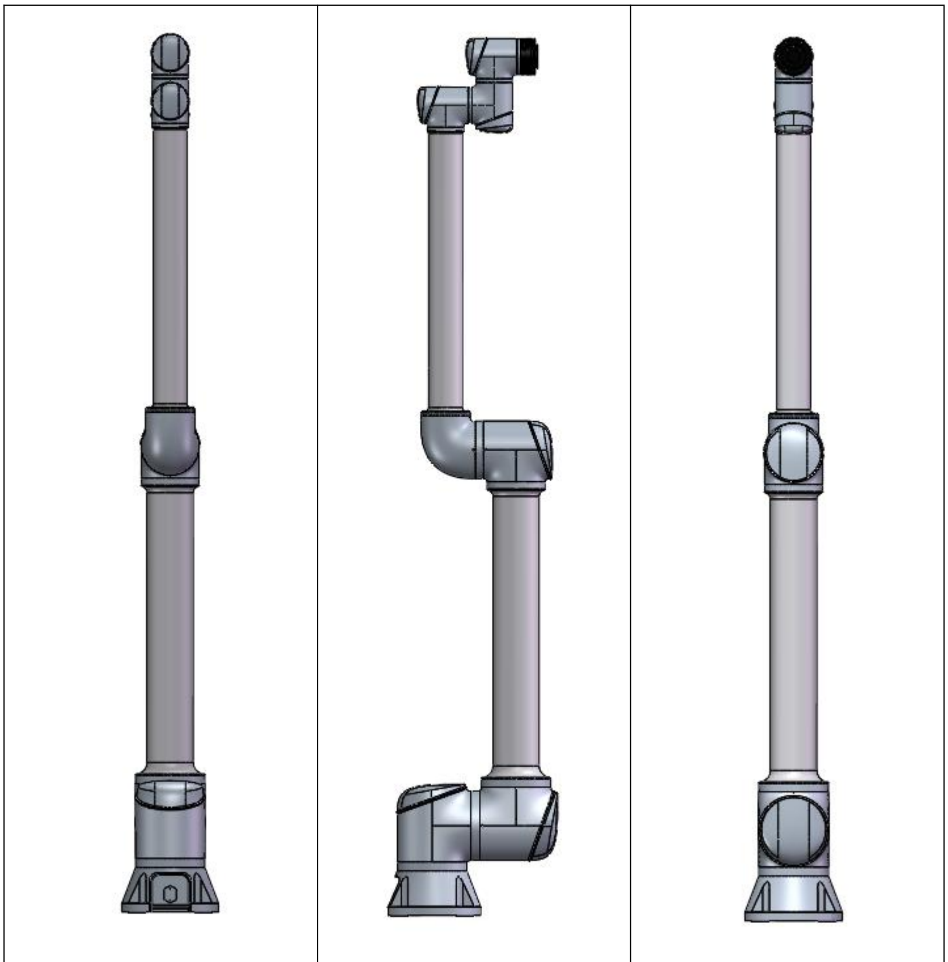
The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 16.25 | 218 |
| **A2** | 22.3 | 270 |
| **A3** | 18.7 | 283 |

# 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.



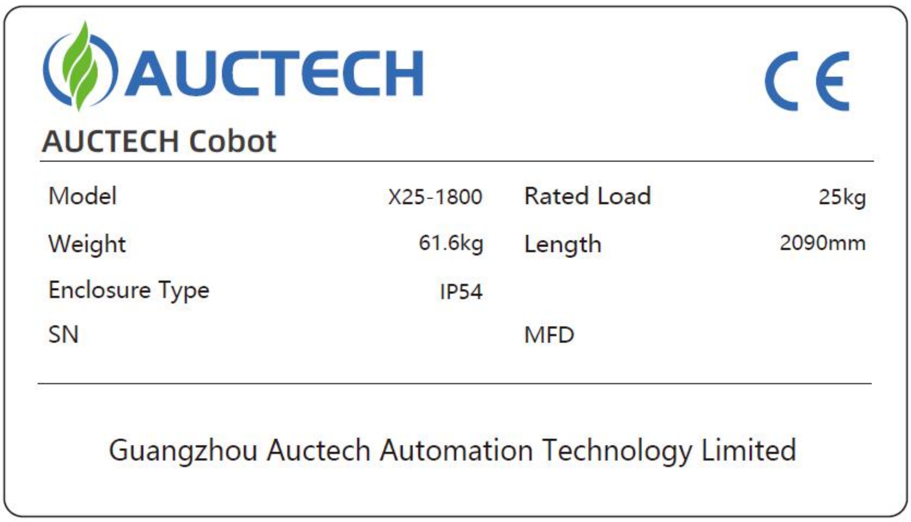



图 4- 3 Nameplates and labels

# 4.5 Mechanical Installation

## 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.

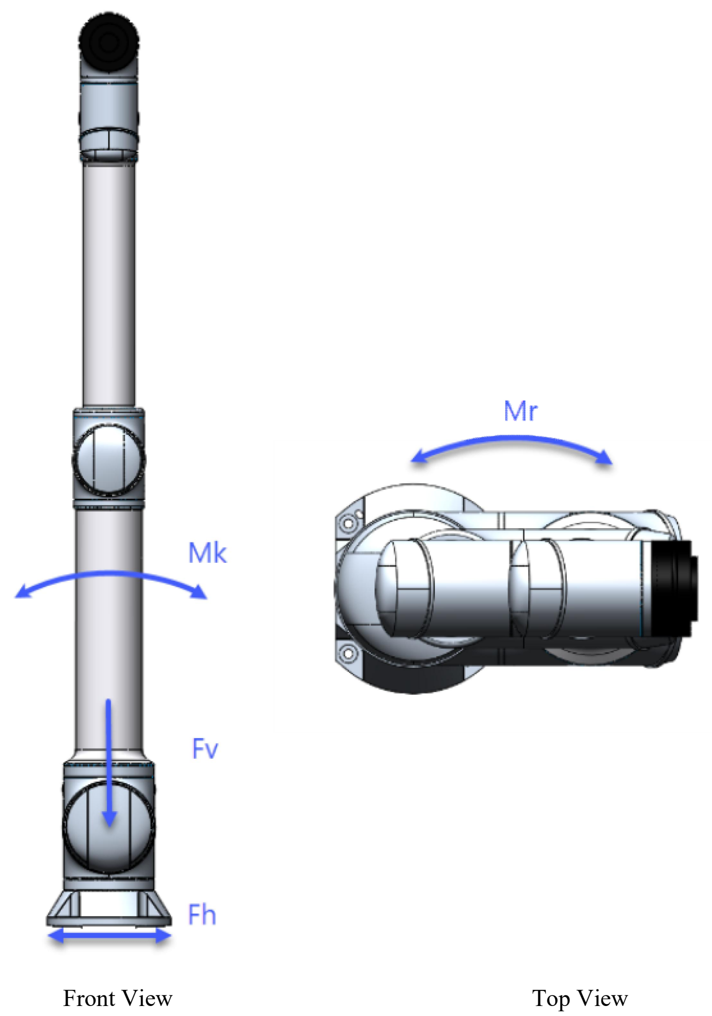



Figure 4- 3 Robot base installation

| Force type | Force/moment |
|---|---|
| Vertical force, Fv | 1160 N |
| Horizontal force, Fh | 1212 N |
| Tilting moment, Mk | 875 Nm |
| Axis 1 moment, Mr | 915 Nm |

| | |
|---|---|
| ⚠Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

### 4.5.2 Base module Installation

The robot body is fixed by four M10 bolts through four 11mm screw holes on the base. 80N・m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base, if needed. The detailed information of installation holes on base is shown in the following figure.

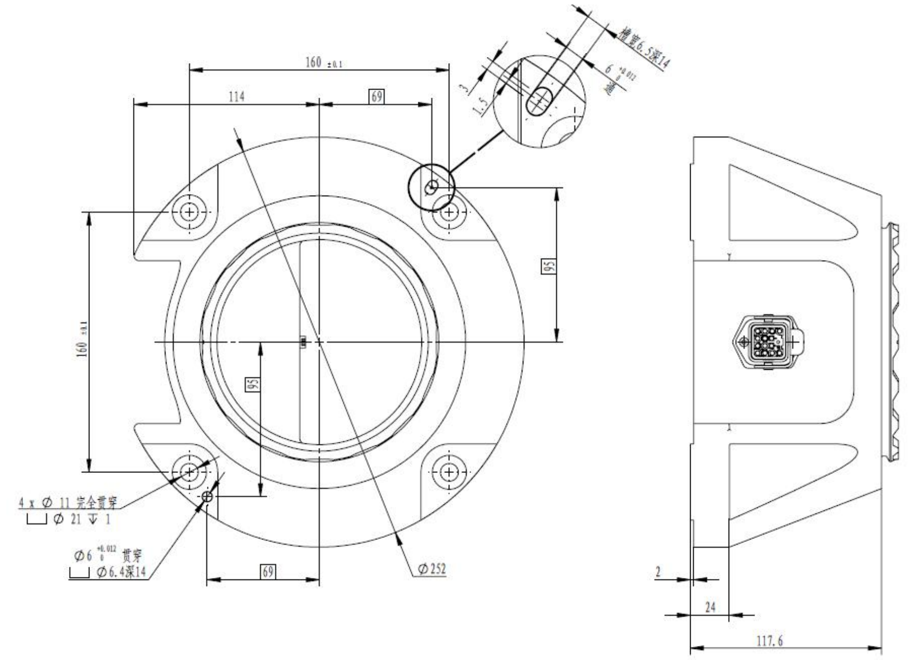



Figure 4- 4 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| ⚠ Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

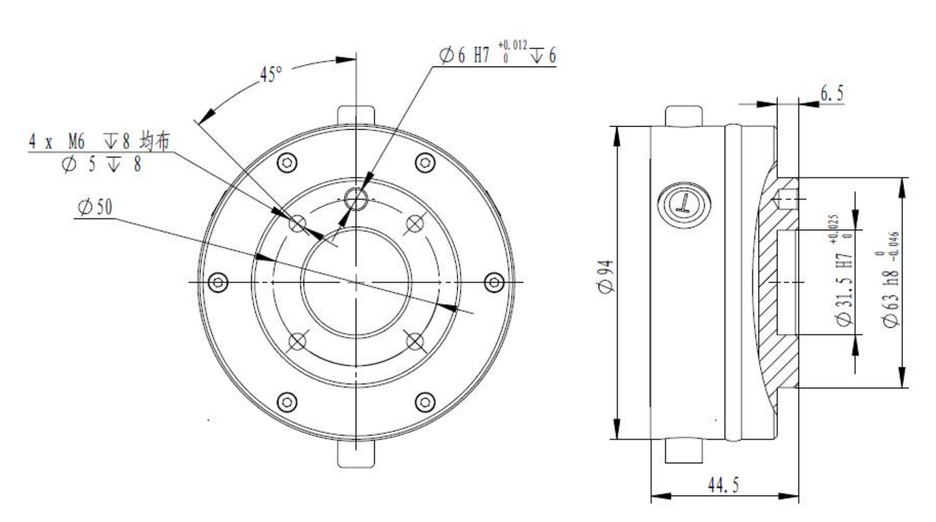



Figure 4- 5 Tool Flange

| | |
|---|---|
| **Load** | 10 kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 12.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

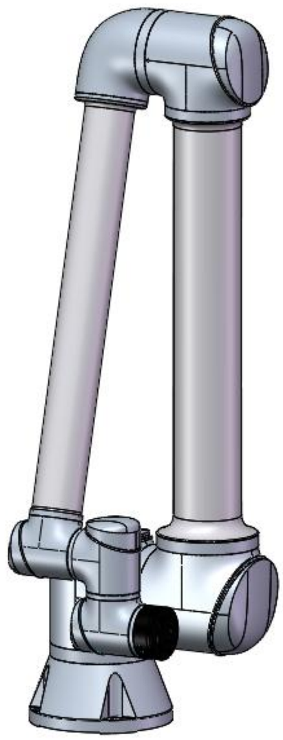
## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
|  | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

### 4.5.5 Packaging Pose

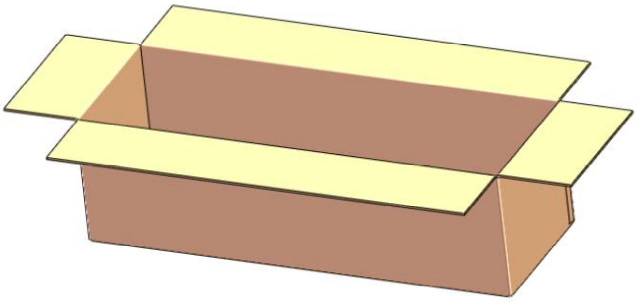
Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:



| Joint | Angle（° ） |
|---|---|
| J6 | 0° |
| J5 | 0° |
| J4 | 15° |
| J3 | 165° |
| J2 | 0° |
| J1 | 0° |

### 4.5.6 Packaging Size

The packaging box size provided is as follows.



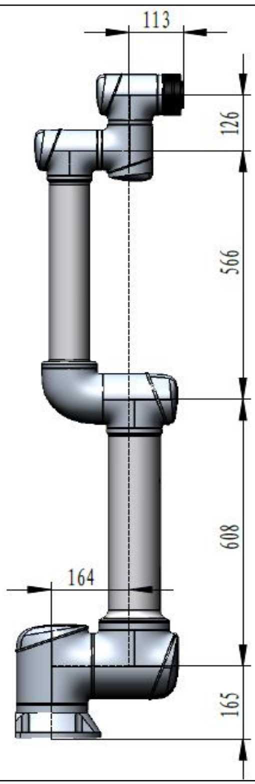
The reference dimension of mechanical arm：1465×516×472 mm 65kg

DSC30D Packaging box size： 480×395×376mm 20kg（D30D-J9）

# 4 （6）X12-1300

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th colspan="2">Label</th><th colspan="2">Data</th></tr>
<tr><td colspan="2">Load</td><td colspan="2">12kg</td></tr>
<tr><td colspan="2">Degree of freedom</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Weight</td><td colspan="2">37.8kg</td></tr>
<tr><td colspan="2">Workspace Radium</td><td colspan="2">1300mm</td></tr>
<tr><td colspan="2">Repeatability</td><td colspan="2">±0.03mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(°  /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>225</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>180</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>180</td></tr>
<tr><td colspan="2">Robot size</td><td colspan="2">1512x 388x 205mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">952x509x516mm</td></tr>
<tr><td colspan="2">Controller size</td><td colspan="2">410×306×292mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">480×395×376mm</td></tr>
<tr><td colspan="2">Installation</td><td colspan="2">Vertical, Horizontal, Upside down</td></tr>
<tr><td colspan="2">Surrounding temperature</td><td colspan="2">-10℃  ~45℃</td></tr>
<tr><td colspan="2">Storage temperature</td><td colspan="2">-40℃~55℃</td></tr>
<tr><td colspan="2">IP code</td><td colspan="2">IP54</td></tr>
<tr><td colspan="2">lifetime</td><td colspan="2">35,000h</td></tr>
<tr><td colspan="2">Noise</td><td colspan="2">≤75dB(A)</td></tr>
</table>

### 4.1.2 Working Space

The work space is as following:

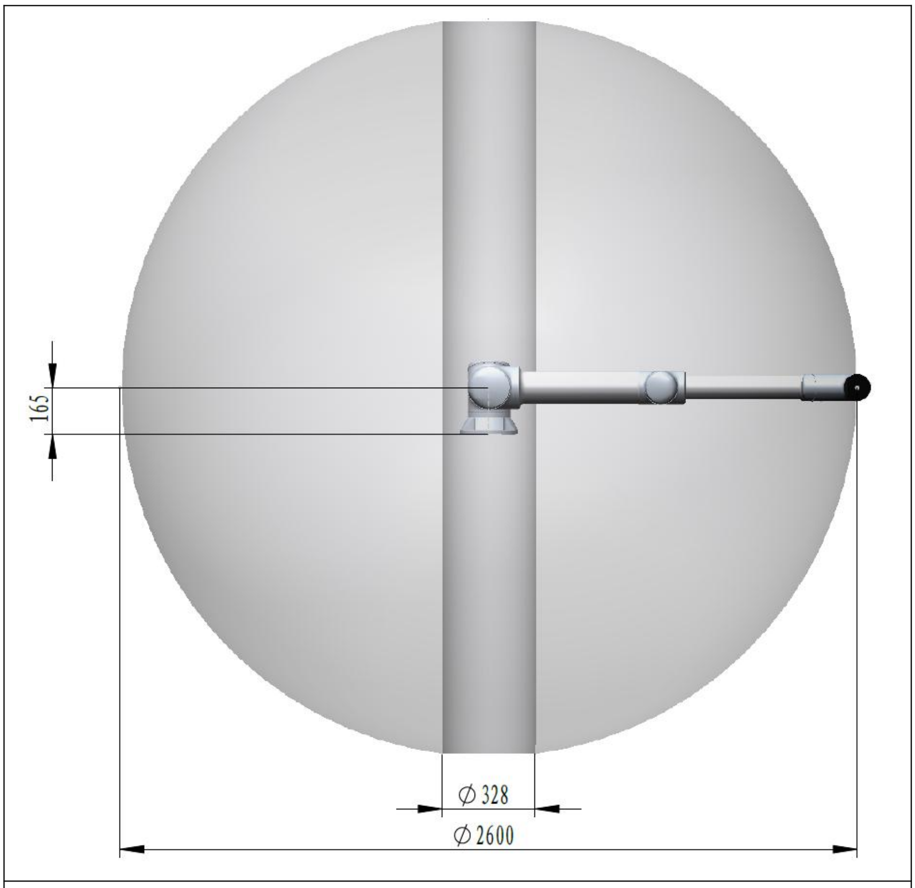



Figure 4- 1 Robot work space

# 4.2 Load

## 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 12kg |
| **J5 Moment of inertia allowance** | 2.14kgm² |
| **J6 Moment of inertia allowance** | 1.28kgm² |
| **Distance of load gravity center, Lxy** | 110.2mm |
| **Distance of load gravity center, Lz** | 230.1mm |

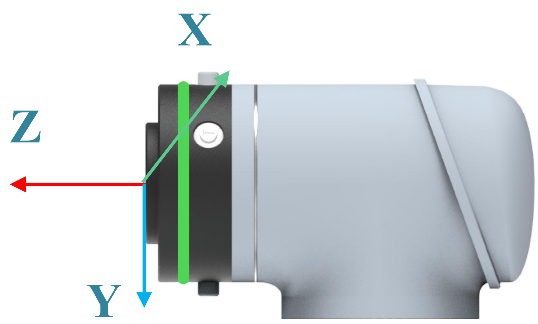
## 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | ● **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



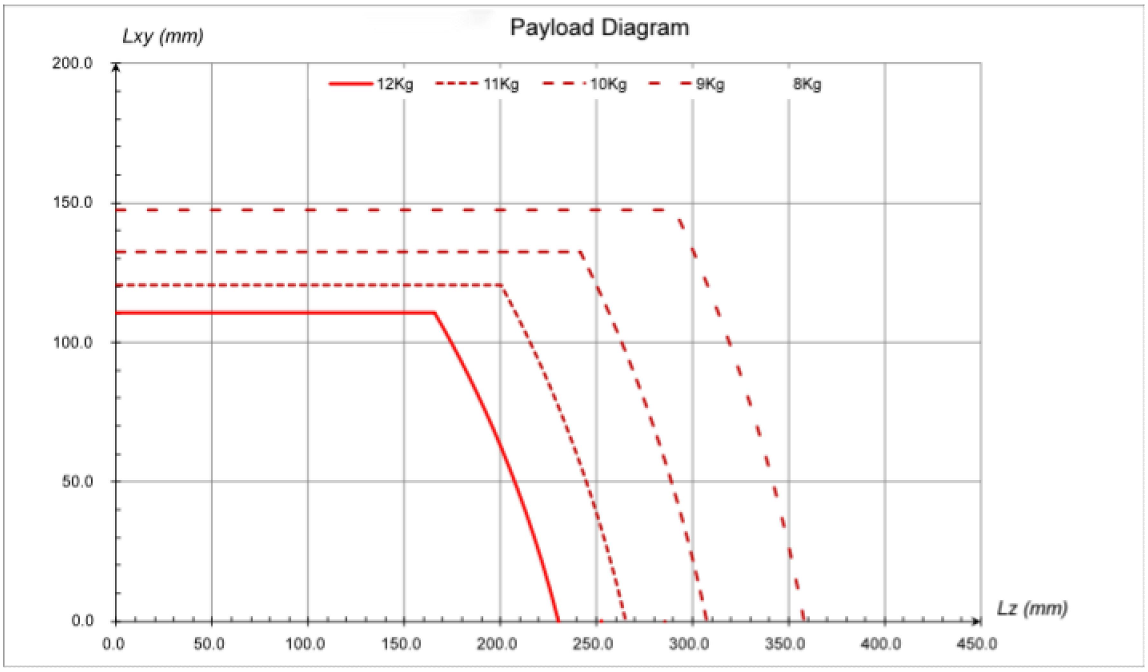




Figure 4- 2 Payload diagram

## 4.3 Stop time and distance

### 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

## 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
| --- | --- | --- |
| **A1** | 9.926 | 228 |
| **A2** | 12.766 | 196 |
| **A3** | 10.268 | 164 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.


Figure 4- 3 Nameplates and labels

# 4.5 Mechanical Installation

## 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.

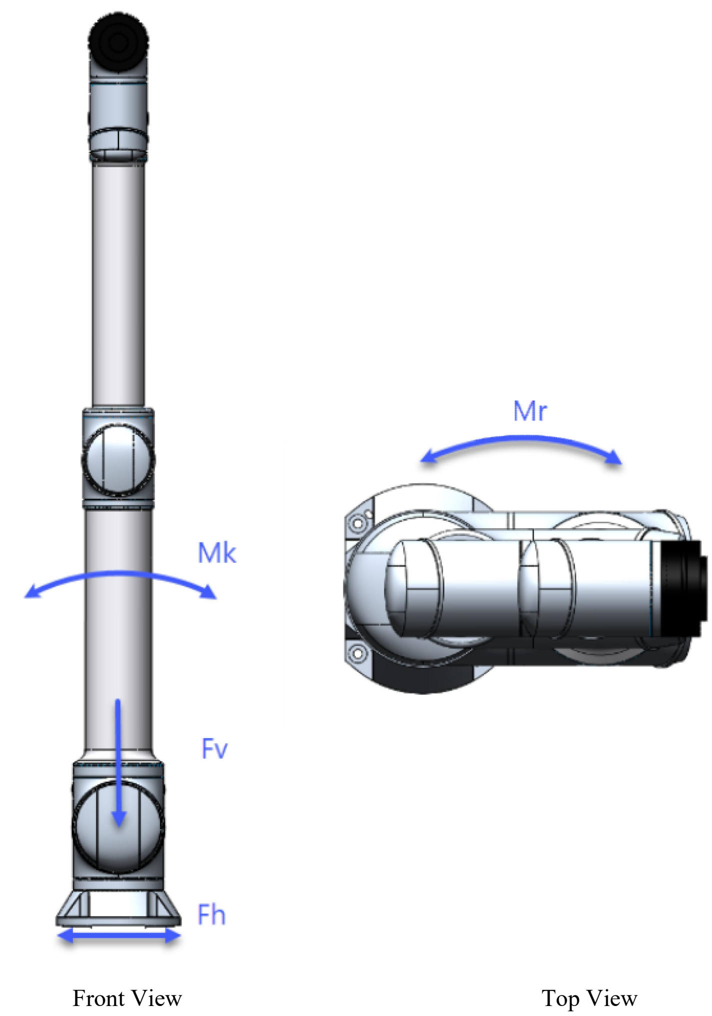



Figure 4- 4 Robot base installation

| **Force type** | Force/moment |
|---|---|
| **Vertical force, Fv** | 730 N |
| **Horizontal force, Fh** | 310 N |
| **Tilting moment, Mk** | 630 Nm |
| **Axis 1 moment, Mr** | 357 Nm |

| | |
|---|---|
| ⚠Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

## 4.5.2 Base module Installation

The robot body is fixed by four M8 bolts through four 9mm screw holes on the base. 35N • m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base, if needed. The detailed information of installation holes on base is shown in the following figure.

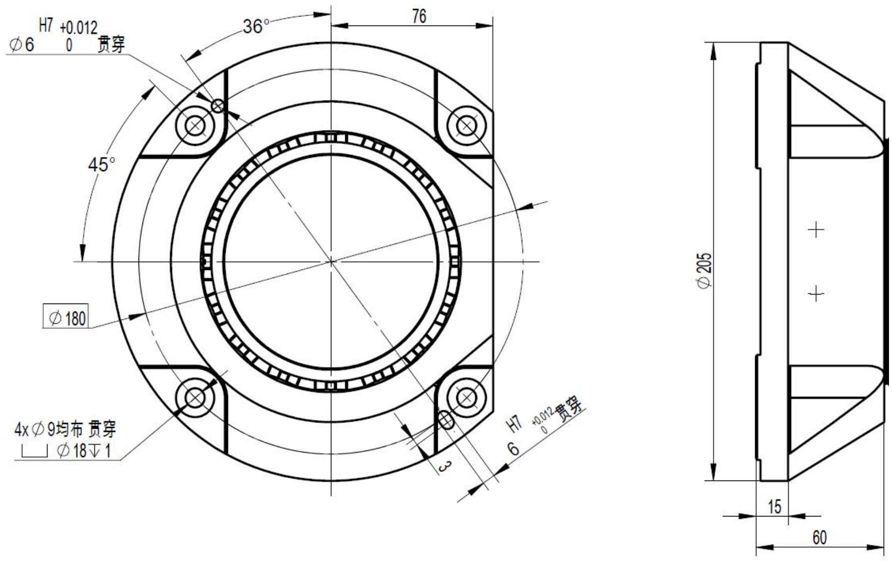



Figure 4- 5 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

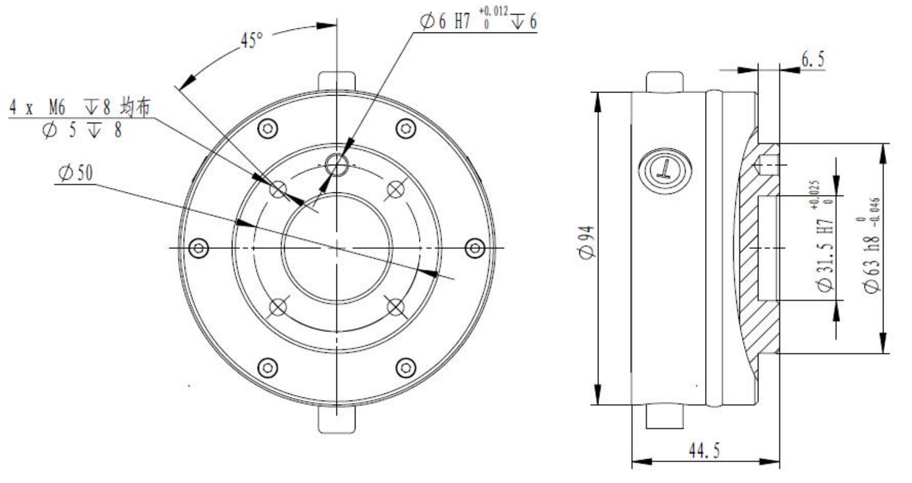



Figure 4- 6 Tool Flange

| | |
|---|---|
| **Load** | 12 kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 12.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

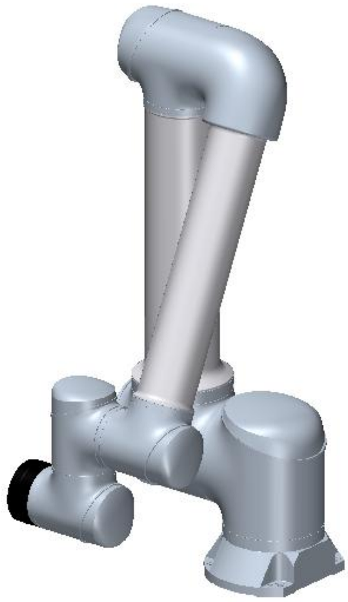
## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| ⚠ Danger | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

### 4.5.5 Packaging Pose

Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:



| Joint | Angle（° ） |
|---|---|
| J6 | 0° |
| J5 | 0° |
| J4 | -25° |
| J3 | -155° |
| J2 | 0° |
| J1 | 0° |

### 4.5.6 Packaging Size

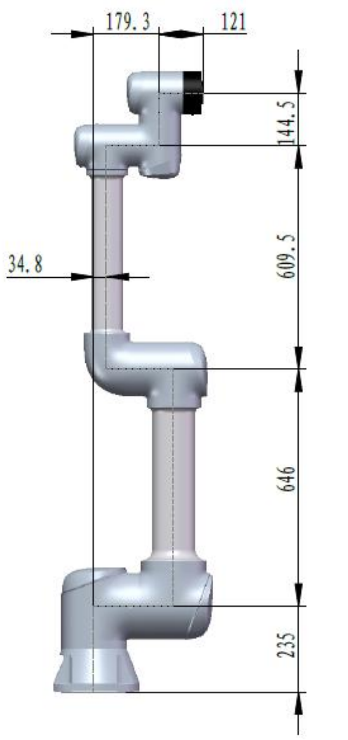
The packaging box size provided is as follows.

<table>
<tr><td></td></tr>
<tr><td>The reference dimension of mechanical arm：952×509×516 mm 46kg</td></tr>
<tr><td></td></tr>
<tr><td>DSC30D Packaging box size： 480×395×376mm 20kg（D30D-J9）</td></tr>
</table>

# 4 （7）X14-1400

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th colspan="2">Label</th><th colspan="2">Data</th></tr>
<tr><td colspan="2">Load</td><td colspan="2">14kg</td></tr>
<tr><td colspan="2">Degree of freedom</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Weight</td><td colspan="2">66kg</td></tr>
<tr><td colspan="2">Workspace Radium</td><td colspan="2">1400mm</td></tr>
<tr><td colspan="2">Repeatability</td><td colspan="2">±0.05mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(°/s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>180</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>120</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>120</td></tr>
<tr><td colspan="2">Robot size</td><td colspan="2">1695×388×205mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">1060×500×600mm</td></tr>
<tr><td colspan="2">Controller size</td><td colspan="2">410×306×292mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="2">480×395×376mm</td></tr>
<tr><td colspan="2">Installation</td><td colspan="2">Vertical, Horizontal, Upside down</td></tr>
<tr><td colspan="2">Surrounding temperature</td><td colspan="2">-10℃ ~45℃</td></tr>
<tr><td colspan="2">Storage temperature</td><td colspan="2">-40℃~55℃</td></tr>
<tr><td colspan="2">IP code</td><td colspan="2">IP54</td></tr>
<tr><td colspan="2">lifetime</td><td colspan="2">35,000h</td></tr>
<tr><td colspan="2">Noise</td><td colspan="2">≤75dB(A)</td></tr>
</table>

### 4.1.2 Working Space

The work space is as following:

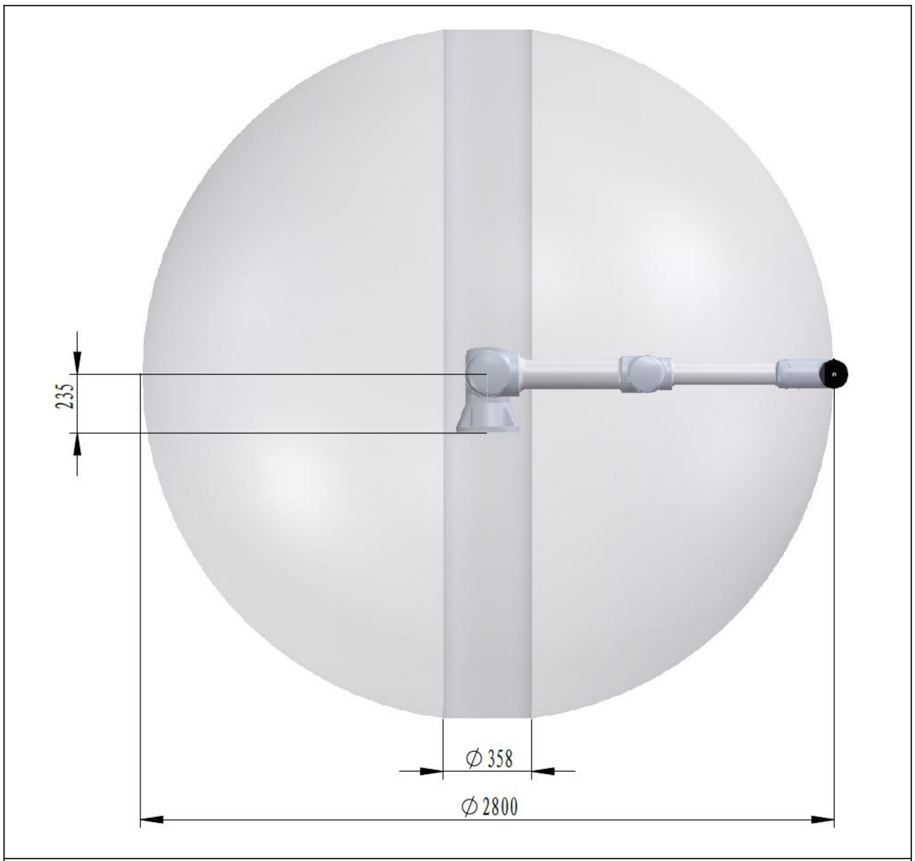



Figure 4- 1 Robot work space

## 4.2 Load

### 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 14kg |
| **J5 Moment of inertia allowance** | $2.2kgm^2$ |
| **J6 Moment of inertia allowance** | $1.1kgm^2$ |
| **Distance of load gravity center, Lxy** | 127.2mm |
| **Distance of load gravity center, Lz** | 224.6mm |

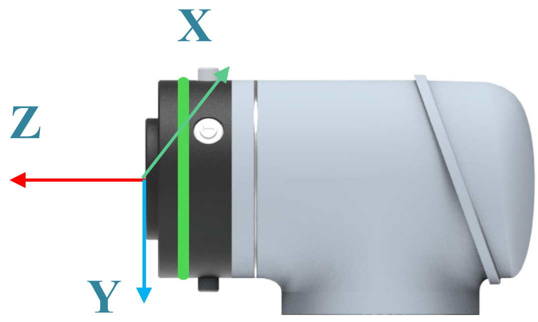
### 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | • **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



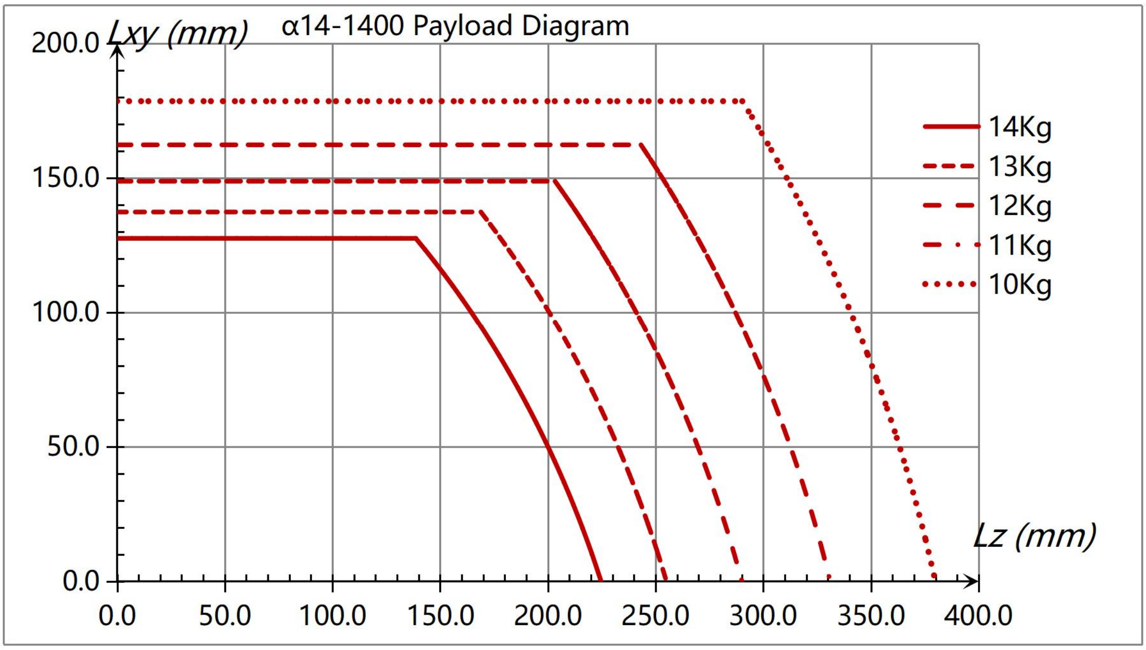




Figure 4- 2 Payload diagram

## 4.3 Stop time and distance

### 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

## 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 22.1 | 217 |
| **A2** | 23.4 | 265 |
| **A3** | 18 | 208 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.

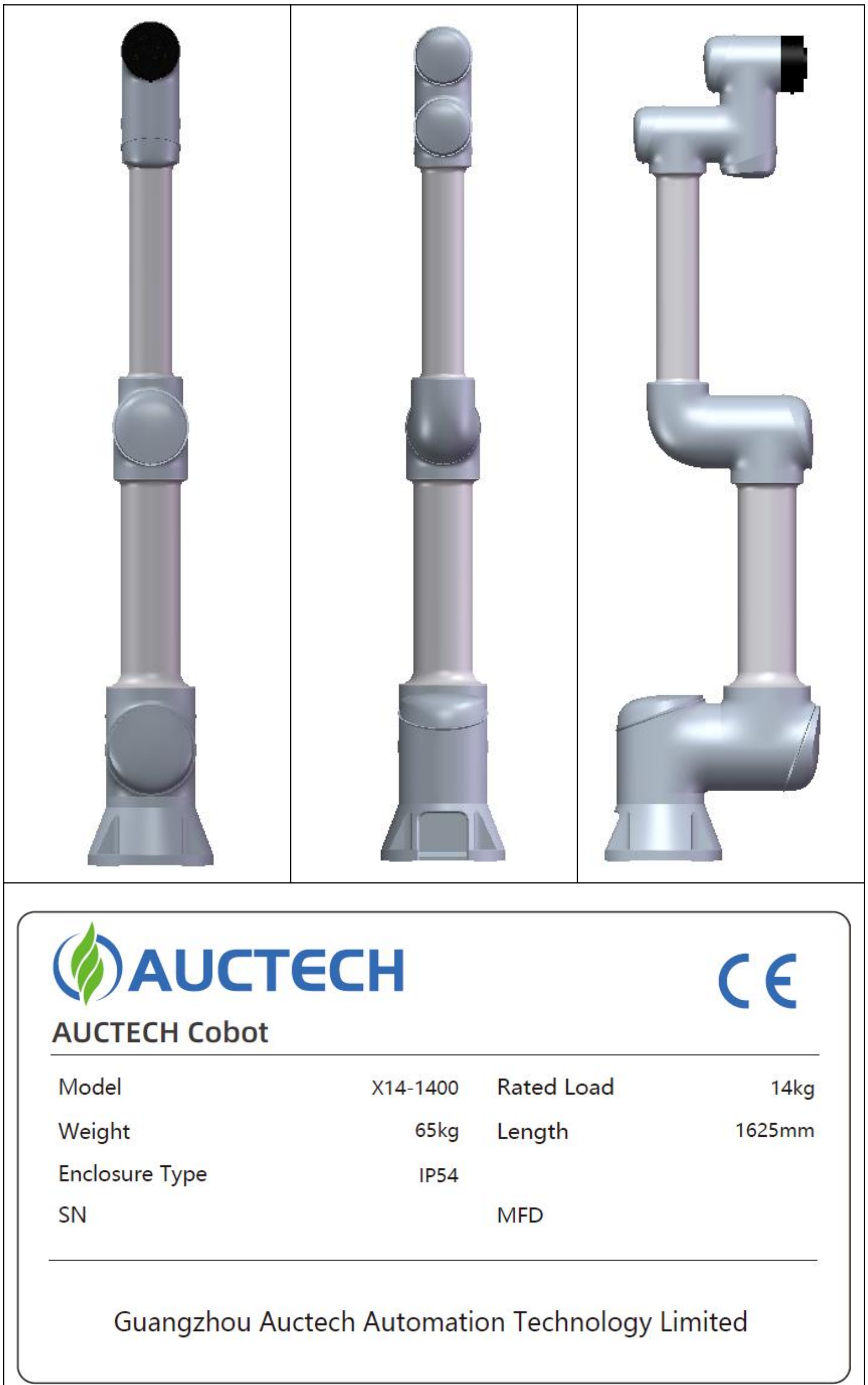
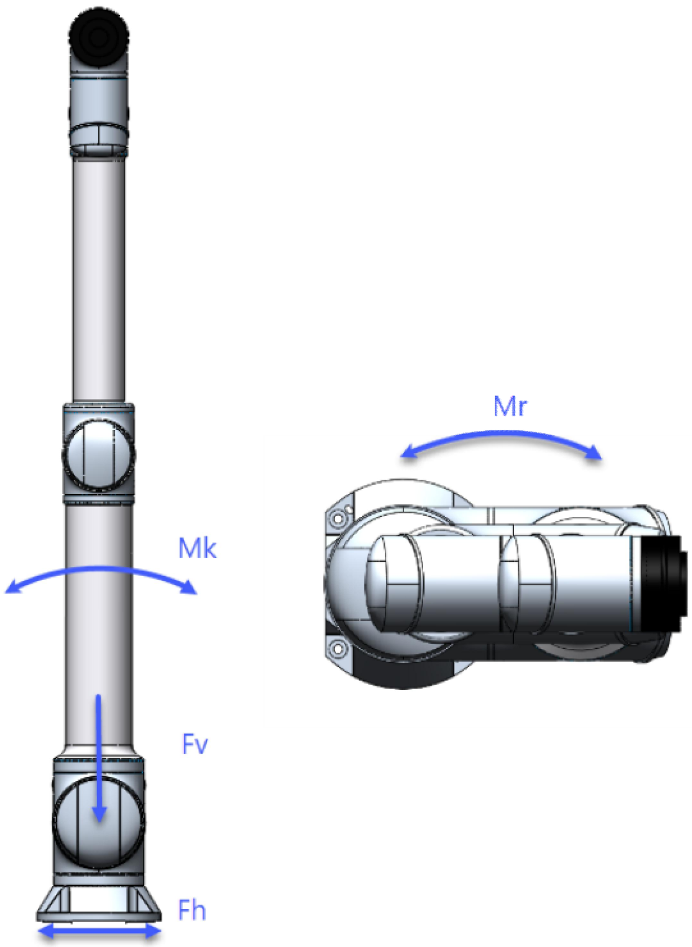



图 4- 3 Nameplates and labels

# 4.5 Mechanical Installation

## 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.




Front View Top View

Figure 4- 3 Robot base installation

| **Force type** | Force/moment |
|---|---|
| **Vertical force, Fv** | 1160 N |
| **Horizontal force, Fh** | 1212 N |
| **Tilting moment, Mk** | 875 Nm |
| **Axis 1 moment, Mr** | 915 Nm |

| | |
|---|---|
| Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

### 4.5.2 Base module Installation

The robot body is fixed by four M10 bolts through four 11mm screw holes on the base. 80N・m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base, if needed. The detailed information of installation holes on base is shown in the following figure.

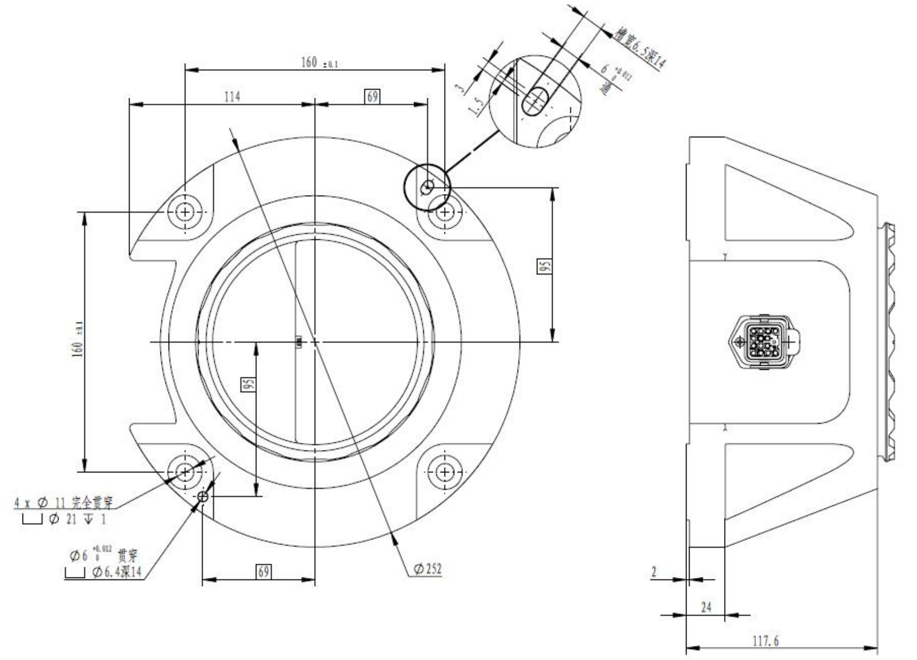



Figure 4- 4 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

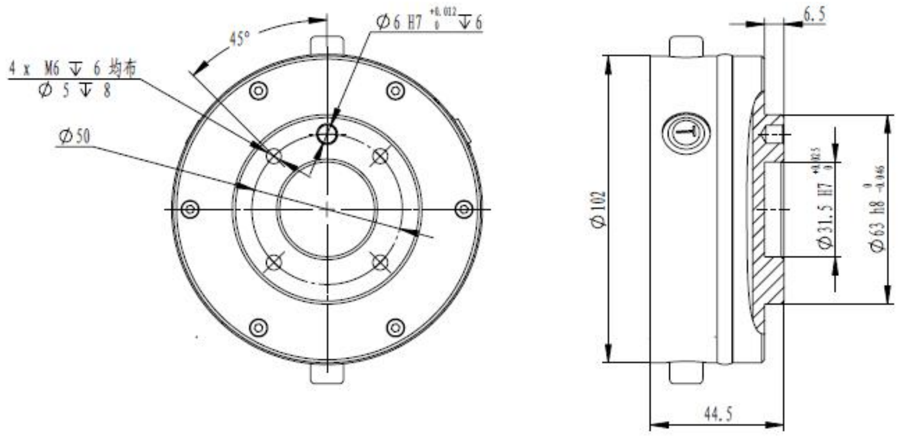



Figure 4- 5 Tool Flange

| | |
|---|---|
| **Load** | 14 kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 12.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

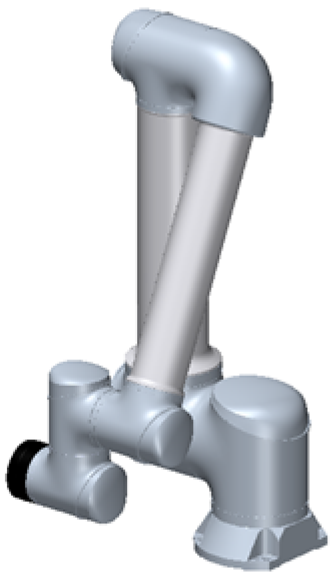
## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| ⚠ Danger | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

## 4.5.5 Packaging Pose

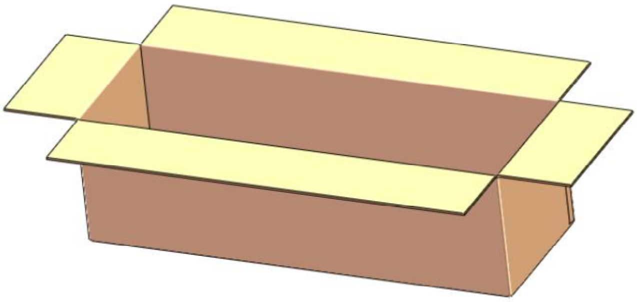
Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:



| Joint | Angle（° ） |
|---|---|
| J6 | 0° |
| J5 | 0° |
| J4 | 25° |
| J3 | 155° |
| J2 | 0° |
| J1 | 0° |

## 4.5.6 Packaging Size

The packaging box size provided is as follows.



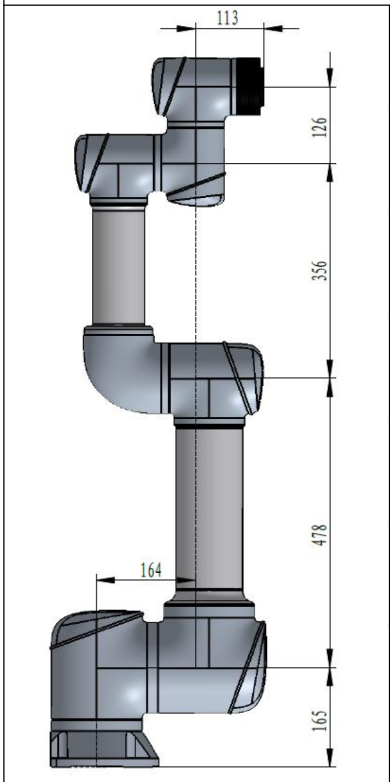
The reference dimension of mechanical arm：1060×500×600mm 75kg

DSC30D Packaging box size：  480×395×376mm 20kg（D30D-J9）

# 4 （8）X16-960

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th colspan="2">Label</th><th colspan="3">Data</th></tr>
<tr><td colspan="2">Load</td><td colspan="3">16kg</td></tr>
<tr><td colspan="2">Degree of freedom</td><td colspan="3">6</td></tr>
<tr><td colspan="2">Weight</td><td colspan="3">37kg</td></tr>
<tr><td colspan="2">Workspace Radium</td><td colspan="3">960mm</td></tr>
<tr><td colspan="2">Repeatability</td><td colspan="3">±0.03mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td colspan="2">Max Velocity(° /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td colspan="2">225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td colspan="2">225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td colspan="2">225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td colspan="2">225</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td colspan="2">180</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td colspan="2">180</td></tr>
<tr><td colspan="2">Robot size</td><td colspan="3">1180x 388x 205mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="3">958x508x516mm</td></tr>
<tr><td colspan="2">Controller size</td><td colspan="3">410×306×292mm</td></tr>
<tr><td colspan="2">Transportation size</td><td colspan="3">480×395×376mm</td></tr>
<tr><td colspan="2">Installation</td><td colspan="3">Vertical, Horizontal, Upside down</td></tr>
<tr><td colspan="2">Surrounding temperature</td><td colspan="3">-10℃ ~45℃</td></tr>
<tr><td colspan="2">Storage temperature</td><td colspan="3">-40℃~55℃</td></tr>
<tr><td colspan="2">IP code</td><td colspan="3">IP54</td></tr>
<tr><td colspan="2">lifetime</td><td colspan="3">35,000h</td></tr>
<tr><td colspan="2">Noise</td><td colspan="3">≤75dB(A)</td></tr>
</table>

## 4.1.2 Working Space

The work space is as following:

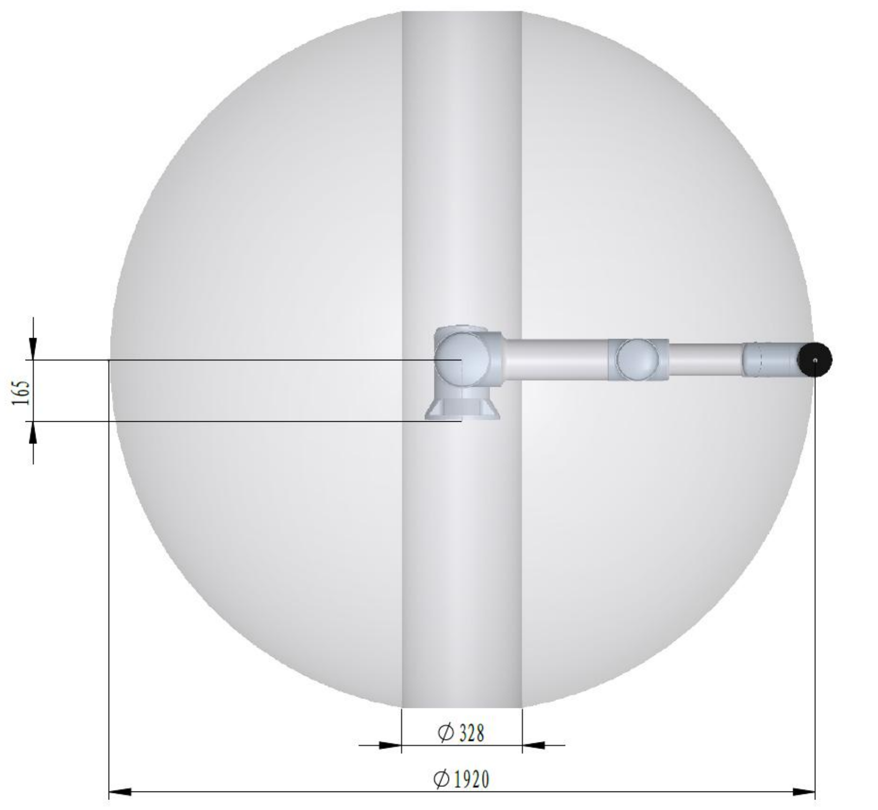



Figure 4- 1 Robot work space

## 4.2 Load

### 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 16 kg |
| **J5 Moment of inertia allowance** | 1.6 $kgm^2$ |
| **J6 Moment of inertia allowance** | 1 $kgm^2$ |
| **Distance of load gravity center, Lxy** | 89.3mm |
| **Distance of load gravity center, Lz** | 108.8 mm |

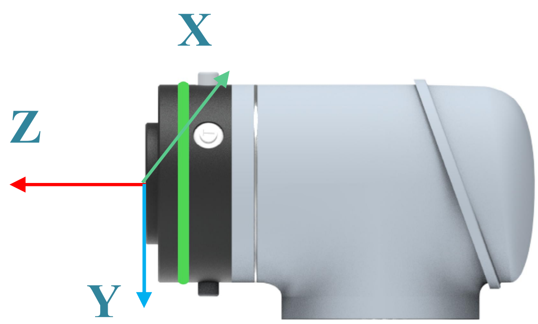
### 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | - **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



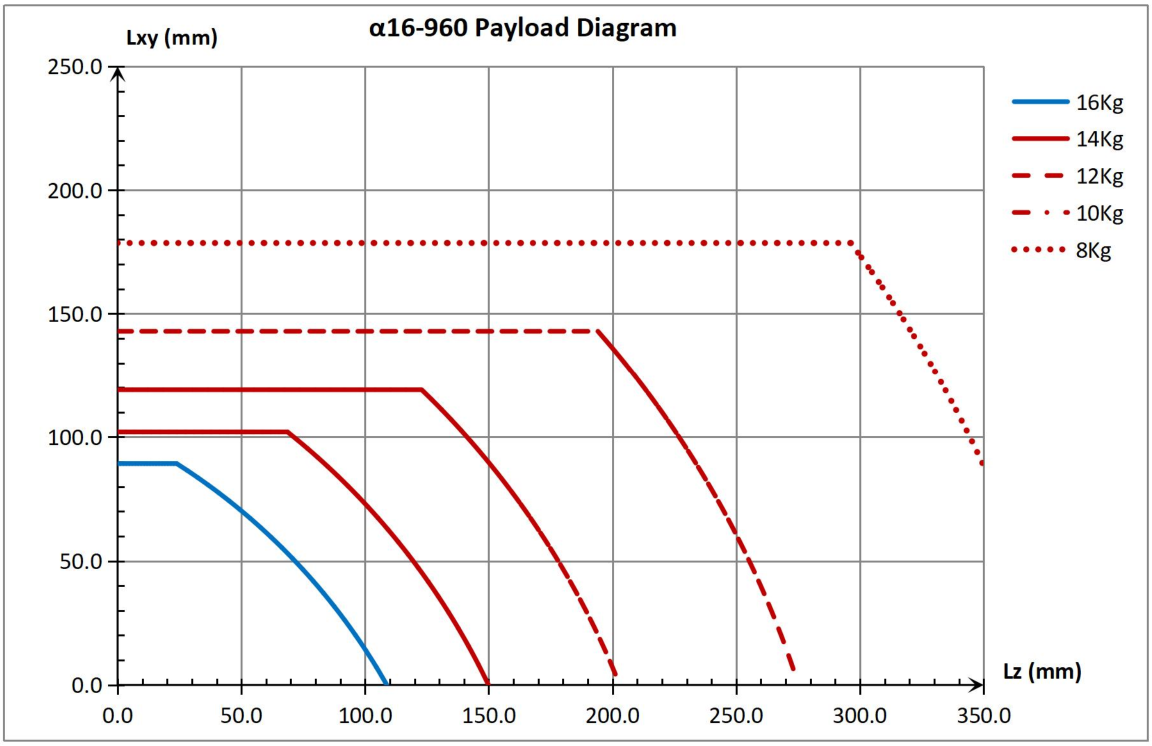




Figure 4- 2 Payload diagram

# 4.3 Stop time and distance

## 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

## 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

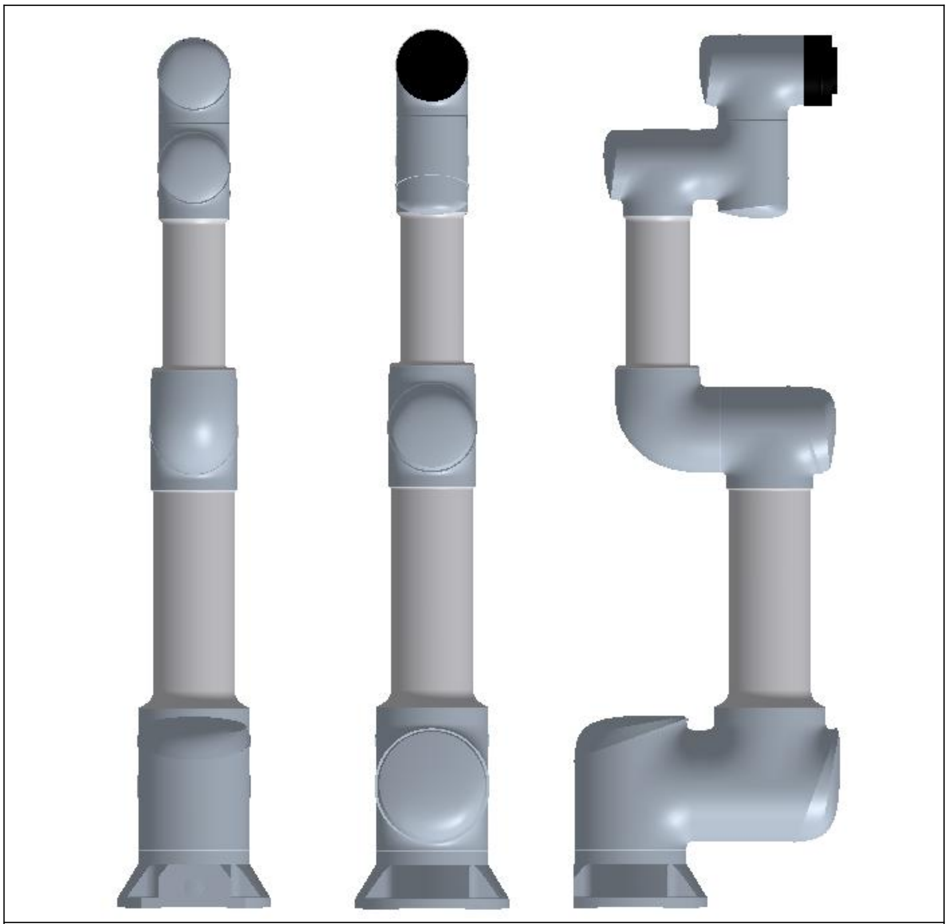
The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 9.926 | 228 |
| **A2** | 12.766 | 196 |
| **A3** | 10.268 | 164 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.



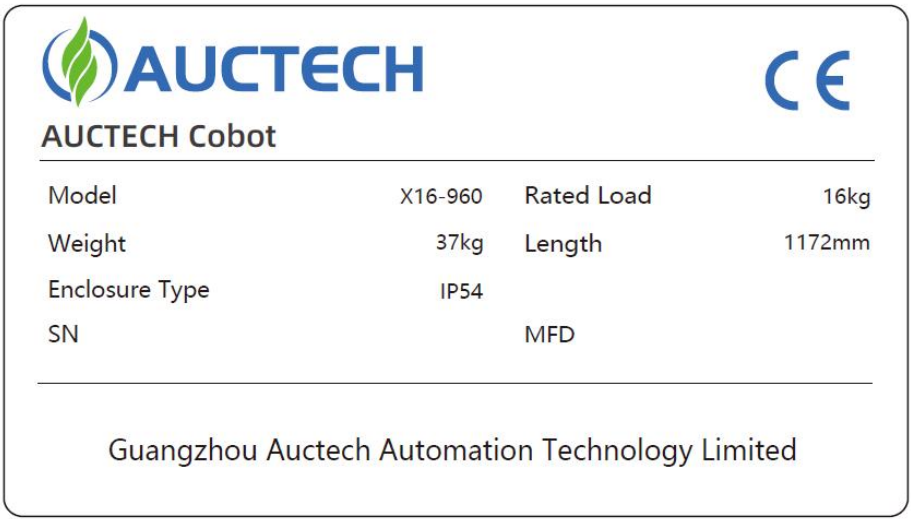



Figure 4- 3 Nameplates and labels

# 4.5 Mechanical Installation

## 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.

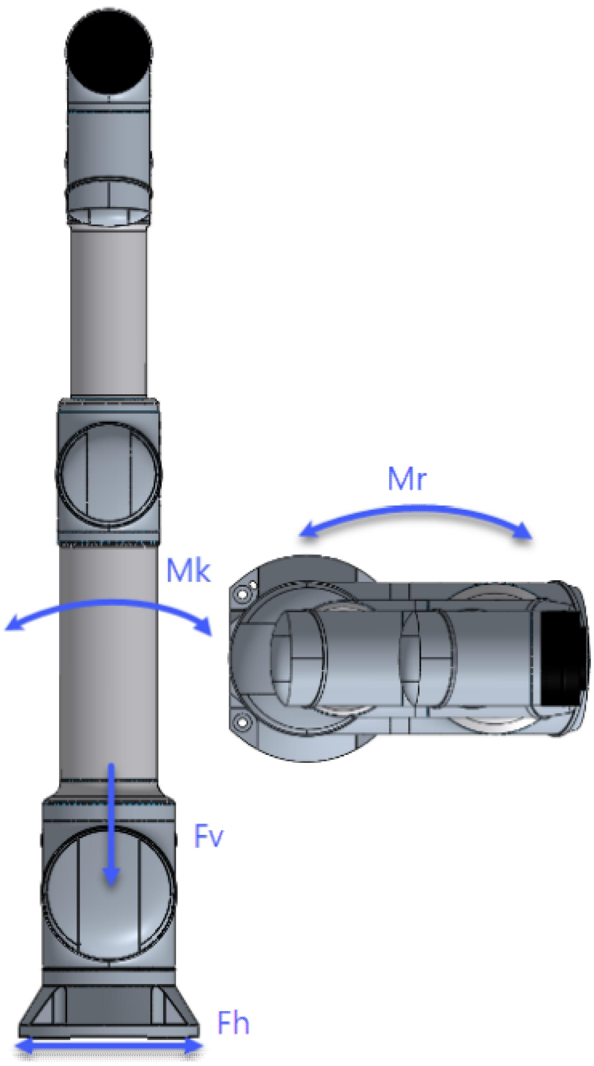



Figure 4- 4 Robot base installation

| Force type | Force/moment |
|---|---|
| Vertical force, Fv | 730 N |
| Horizontal force, Fh | 310 N |
| Tilting moment, Mk | 630 Nm |
| Axis 1 moment, Mr | 357 Nm |

| | |
|---|---|
| Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could** |

| | |
|---|---|
| | **result in personal injury or property damage.** |

## 4.5.2 Base module Installation

The robot body is fixed by four M8 bolts through four 9mm screw holes on the base. 35N・m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on base, if needed. The detailed information of installation holes on base is shown in the following figure.

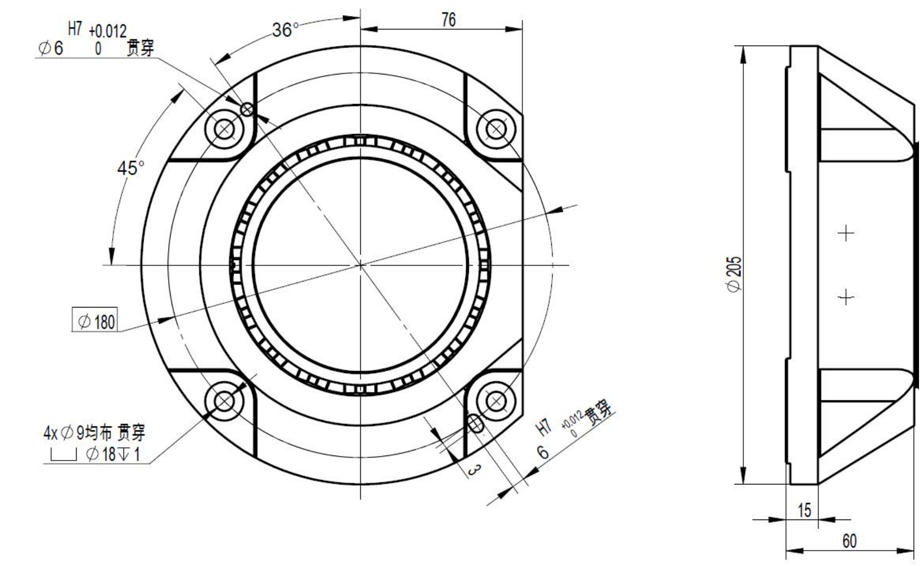



Figure 4- 5 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| ⚠ Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

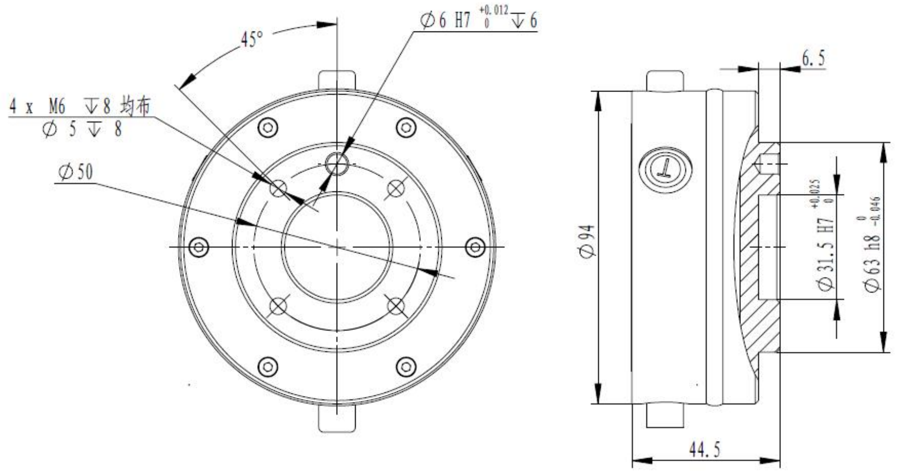



Figure 4- 6 Tool Flange

| | |
|---|---|
| **Load** | 16 kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 12.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

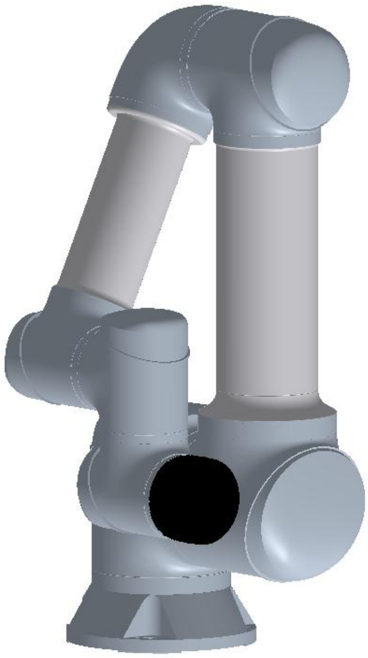
## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| Danger | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

## 4.5.5 Packaging Pose

Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:



| **Joint** | **Angle（°）** |
|---|---|
| **J6** | **0°** |
| **J5** | **0°** |
| **J4** | **25°** |
| **J3** | **155°** |
| **J2** | **0°** |
| **J1** | **0°** |

## 4.5.6 Packaging Size

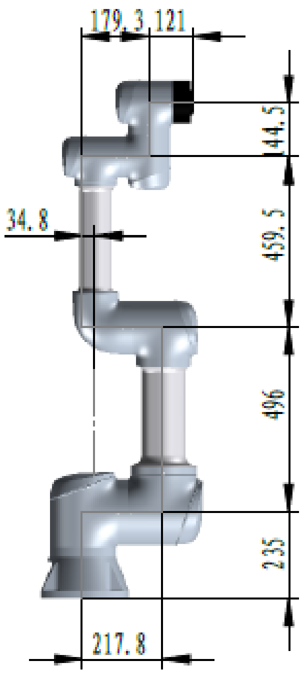
The packaging box size provided is as follows.

| |
|---|
|  |
| The reference dimension of mechanical arm：952×509×516 mm 46kg |
|  |
| DSC30D Packaging box size：  480×395×376mm 20kg（D30D-J9） |

# 4 （9）X20-1100

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th>Label</th><th colspan="3">Data</th></tr>
<tr><td>Load</td><td colspan="3">20kg</td></tr>
<tr><td>Degree of freedom</td><td colspan="3">6</td></tr>
<tr><td>Weight</td><td colspan="3">65kg</td></tr>
<tr><td>Workspace Radium</td><td colspan="3">1100mm</td></tr>
<tr><td>Repeatability</td><td colspan="3">±0.05mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(° /s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>180</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>120</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>120</td></tr>
<tr><td>Robot size</td><td colspan="3">1395×420×290mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">1060×500×600mm</td></tr>
<tr><td>Controller size</td><td colspan="3">410×306×292mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">480×395×376mm</td></tr>
<tr><td>Installation</td><td colspan="3">Vertical, Horizontal, Upside down</td></tr>
<tr><td>Surrounding temperature</td><td colspan="3">-10℃ ~45℃</td></tr>
<tr><td>Storage temperature</td><td colspan="3">-40℃~55℃</td></tr>
<tr><td>IP code</td><td colspan="3">IP54</td></tr>
<tr><td>lifetime</td><td colspan="3">35,000h</td></tr>
<tr><td>Noise</td><td colspan="3">≤75dB(A)</td></tr>
</table>

### 4.1.2 Working Space

The work space is as following:

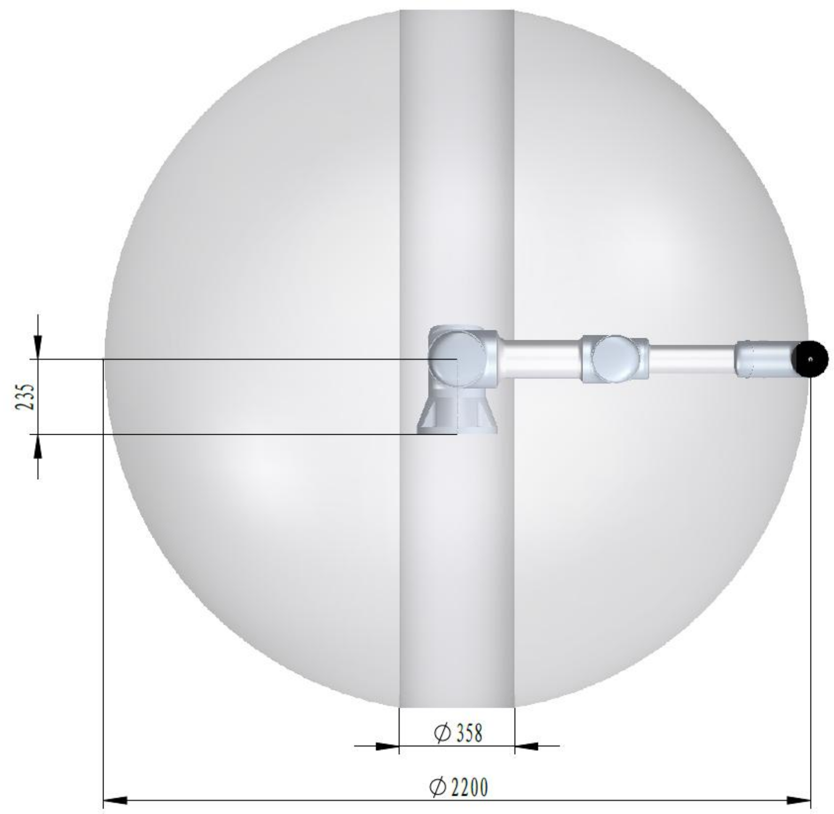



Figure 4- 1 Robot work space

# 4.2 Load

## 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 20kg |
| **J5 Moment of inertia allowance** | 2.2kgm² |
| **J6 Moment of inertia allowance** | 1.1kgm² |
| **Distance of load gravity center, Lxy** | 96.9mm |
| **Distance of load gravity center, Lz** | 122.0mm |

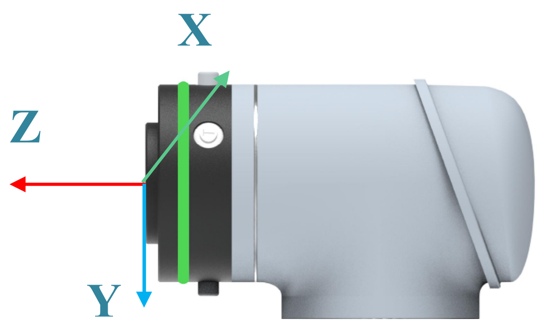
## 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| **Care** | ● **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



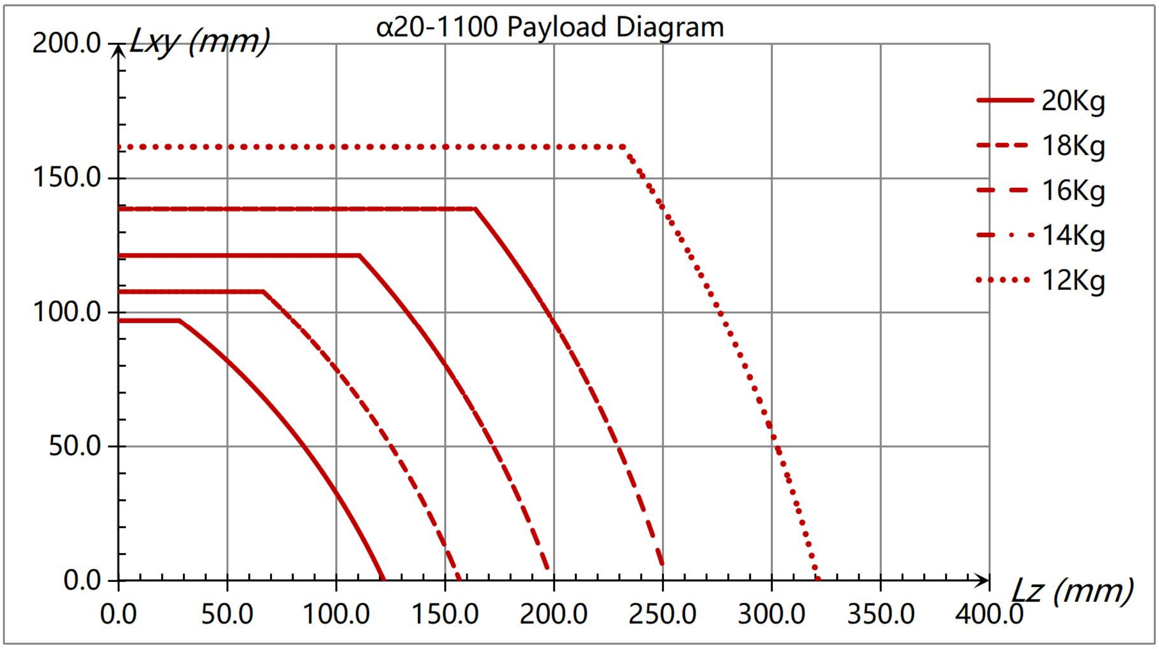




Figure 4- 2 Payload diagram

## 4.3 Stop time and distance

### 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

### 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 22.1 | 217 |
| **A2** | 23.4 | 265 |
| **A3** | 18 | 208 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.

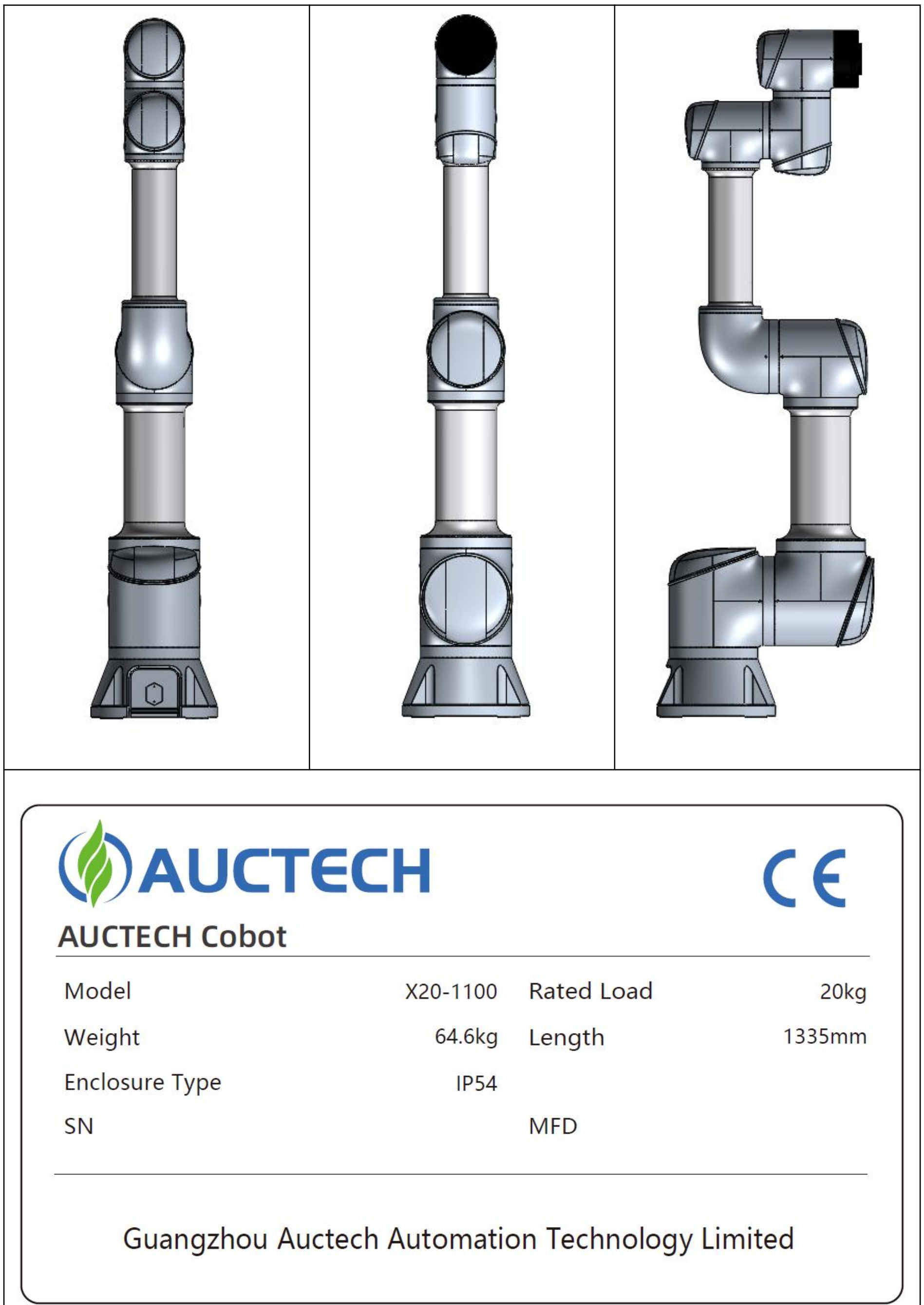
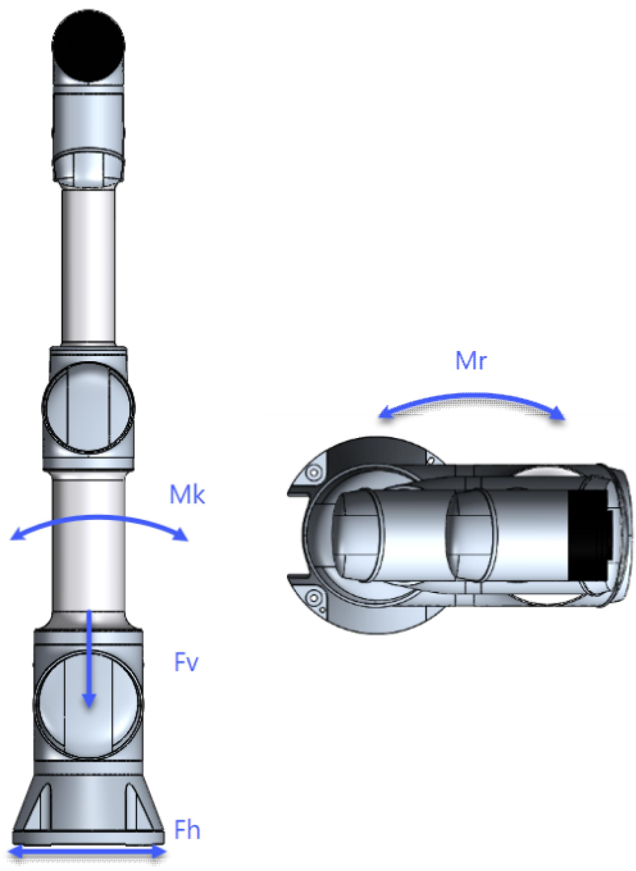



图 4- 3 Nameplates and labels

## 4.5 Mechanical Installation

### 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.




Front View

Top View

Figure 4- 3 Robot base installation

| Force type | Force/moment |
|---|---|
| **Vertical force, Fv** | 1160 N |
| **Horizontal force, Fh** | 1212 N |
| **Tilting moment, Mk** | 875 Nm |
| **Axis 1 moment, Mr** | 915 Nm |

| | |
|---|---|
| ⚠Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

## 4.5.2 Base module Installation

The robot body is fixed by four M10 bolts through four 11mm screw holes on the base. 80N • m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on the base, if needed. The detailed information of installation holes on base is shown in the following figure.

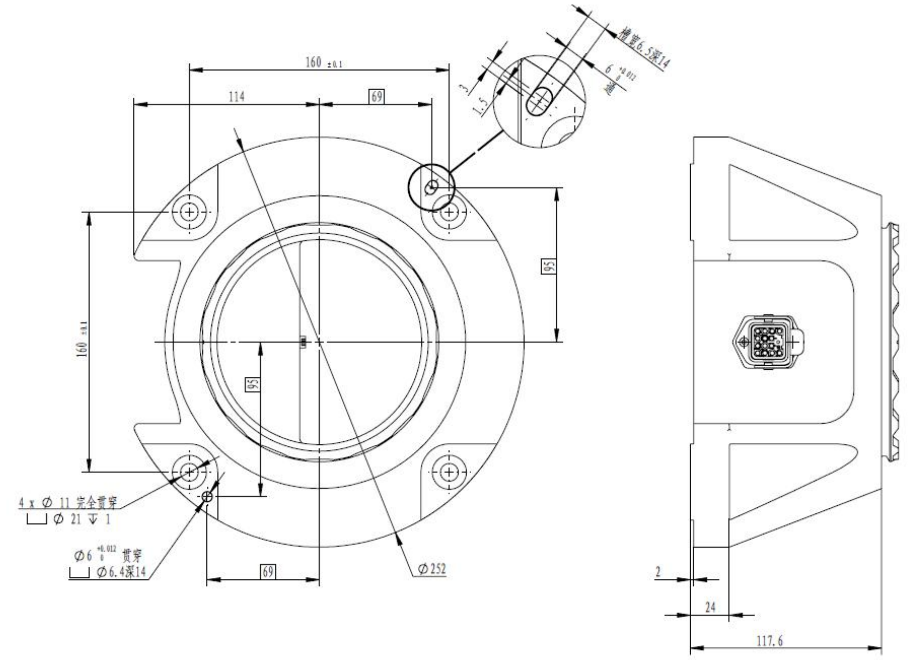



Figure 4- 4 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| ⚠ Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

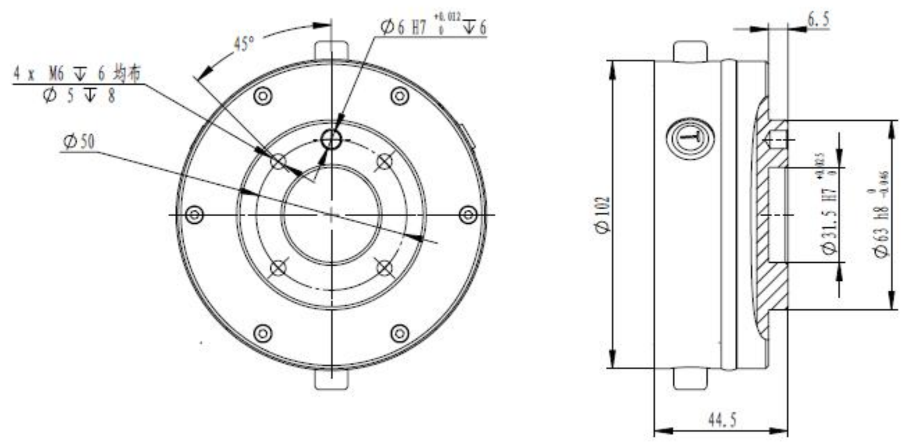



Figure 4- 5 Tool Flange

| | |
|---|---|
| **Load** | 20 kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 12.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| Danger | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

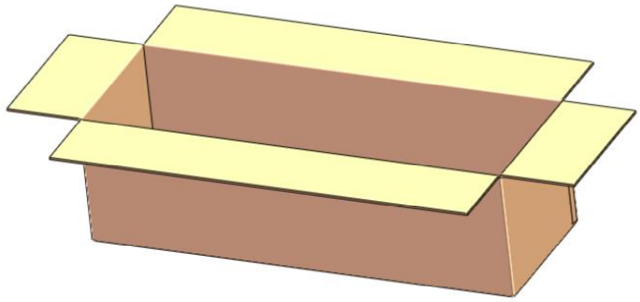
### 4.5.5 Packaging Pose

Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:

| Joint | Angle（°） |
|---|---|
| J6 | 0° |
| J5 | 0° |
| J4 | 25° |
| J3 | 155° |
| J2 | 0° |
| J1 | 0° |

## 4.5.6 Packaging Size

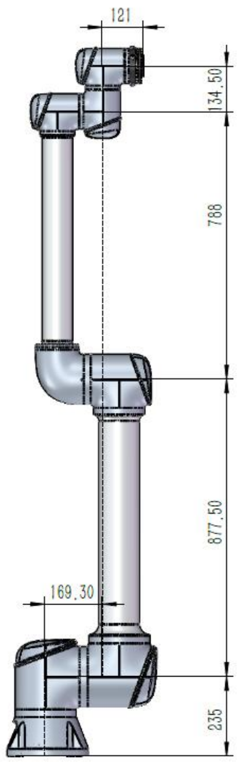
The packaging box size provided is as follows.

| |
|---|
|  |
| The reference dimension of mechanical arm：1060×500×600mm 75kg |
|  |
| DSC30D Packaging box size： 480×395×376mm 20kg（D30D-J9） |

# 4 （10）X25-1800

## 4.1 Robot Technical Data

### 4.1.1 Basic Data

<table>
<tr><th>Label</th><th colspan="3">Data</th></tr>
<tr><td>Load</td><td colspan="3">25kg</td></tr>
<tr><td>Degree of freedom</td><td colspan="3">6</td></tr>
<tr><td>Weight</td><td colspan="3">61.6kg</td></tr>
<tr><td>Workspace Radium</td><td colspan="3">1800mm</td></tr>
<tr><td>Repeatability</td><td colspan="3">±0.05mm</td></tr>
<tr><td rowspan="7">
</td><td>Joint</td><td>Range</td><td>Max Velocity(°/s)</td></tr>
<tr><td>J6</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J5</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J4</td><td>+360° to -360 °</td><td>225</td></tr>
<tr><td>J3</td><td>+160° to -160 °</td><td>150</td></tr>
<tr><td>J2</td><td>+360° to -360 °</td><td>100</td></tr>
<tr><td>J1</td><td>+360° to -360 °</td><td>120</td></tr>
<tr><td>Robot size</td><td colspan="3">2090x 440x 252mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">1295×540×515mm</td></tr>
<tr><td>Controller size</td><td colspan="3">410×306×292mm</td></tr>
<tr><td>Transportation size</td><td colspan="3">480×395×376mm</td></tr>
<tr><td>Installation</td><td colspan="3">Vertical</td></tr>
<tr><td>Surrounding temperature</td><td colspan="3">-10℃ ~45℃</td></tr>
<tr><td>Storage temperature</td><td colspan="3">-40℃~55℃</td></tr>
<tr><td>IP code</td><td colspan="3">IP54</td></tr>
<tr><td>lifetime</td><td colspan="3">35,000h</td></tr>
<tr><td>Noise</td><td colspan="3">≤75dB(A)</td></tr>
</table>

### 4.1.2 Working Space

The work space is as following:

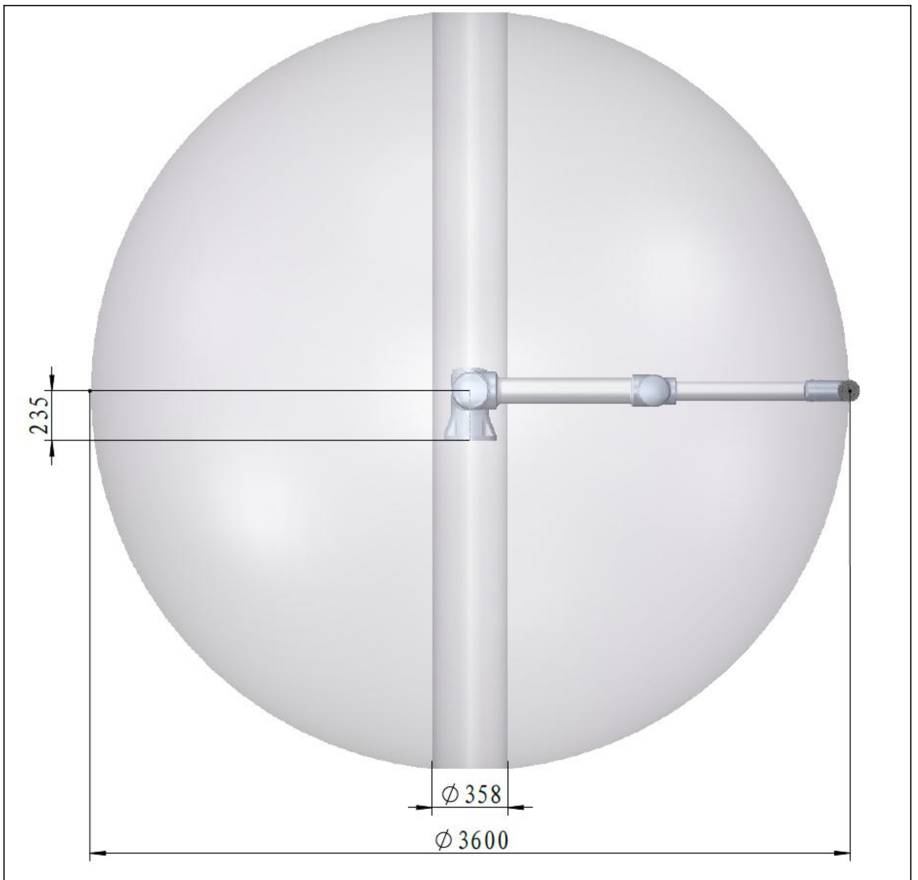



Figure 4- 1 Robot work space

## 4.2 Load

### 4.2.1 Basic Load data

| | |
|---|---|
| **Rated load** | 25kg |
| **J5 Moment of inertia allowance** | 2.2kgm² |
| **J6 Moment of inertia allowance** | 1.1kgm² |
| **Distance of load gravity center, Lxy** | 81.5mm |
| **Distance of load gravity center, Lz** | 119.8mm |

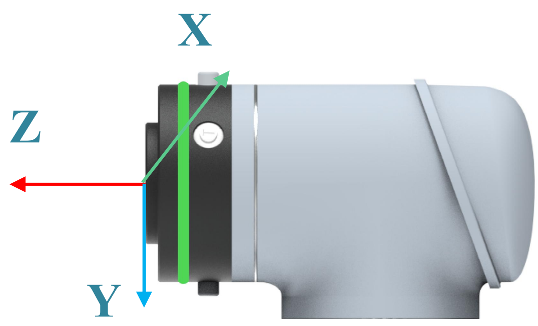
### 4.2.2 Payload Diagram

Rated load is related with load weight and the distance between load center of gravity and flange end plane. The relationship, load weight versus the distance between load center of gravity and flange end plane, is illustrated as below.

| | |
|---|---|
| Care | ● **It is NOT allowed over load! Over loading may be dangerous and affect significantly on robot lifespan.** |

The diagram illustrates the maximum loading capability. For safety concern, it requires a safety check, load and moment of inertia, whenever the load has been changed.

The load and moments of inertia obtained here are very important in planning the use of the robot. According to the corresponding operation and programming guide, it is necessary to input the load and moment of inertia into the robot control system when operating the robot into operation.



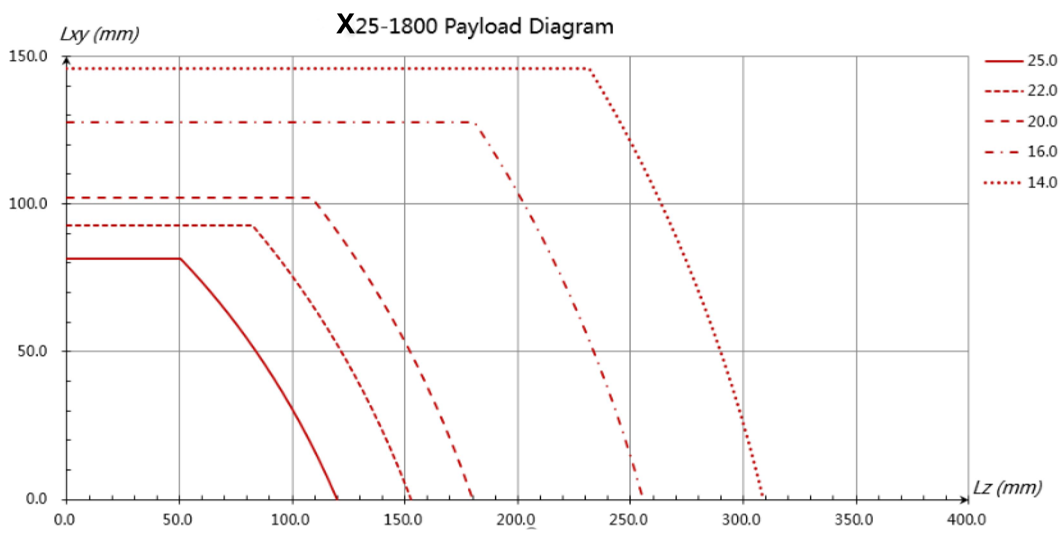




Figure 4- 2 Payload diagram

## 4.3 Stop time and distance

### 4.3.1 Introduction

General break information:

- Stop distance refers to the angle rotated from receiving the stop signal to fully stopped status.
- Stop time refers to the duration from the robot receives stop signal to fully stopped status.
- The data illustrate is for axes A1, A2 and A3. The base axis is where maximum deflection appears.
- Axis movements that overlap each other may cause the stop stroke to become longer.
- The time and distance delayed is based on DIN EN ISO 10218-1。
- Stop type：

  **Stop category 0** » Stop0

  **Stop category 1** » Stop1

According to IEC 60204-1：

- The values specified for Stop 0 are guide values determined by means of tests and simulation. They are average values which are conform to the requirements of DIN EN ISO 10218-1. The actual stopping distances and stopping times may be different due to internal and external influences on the braking torque. It is, therefore, advisable to determine the exact stopping distances and stopping times where necessary under the real conditions of the actual robot application.
- The wear on the brakes varies depending on the operating mode, robot application and the number of STOP 0 stops triggered. It is therefore advisable to check the stopping distance at least once a year.

### 4.3.2 Stop time and distance for Axis 1-3 in Stop 0

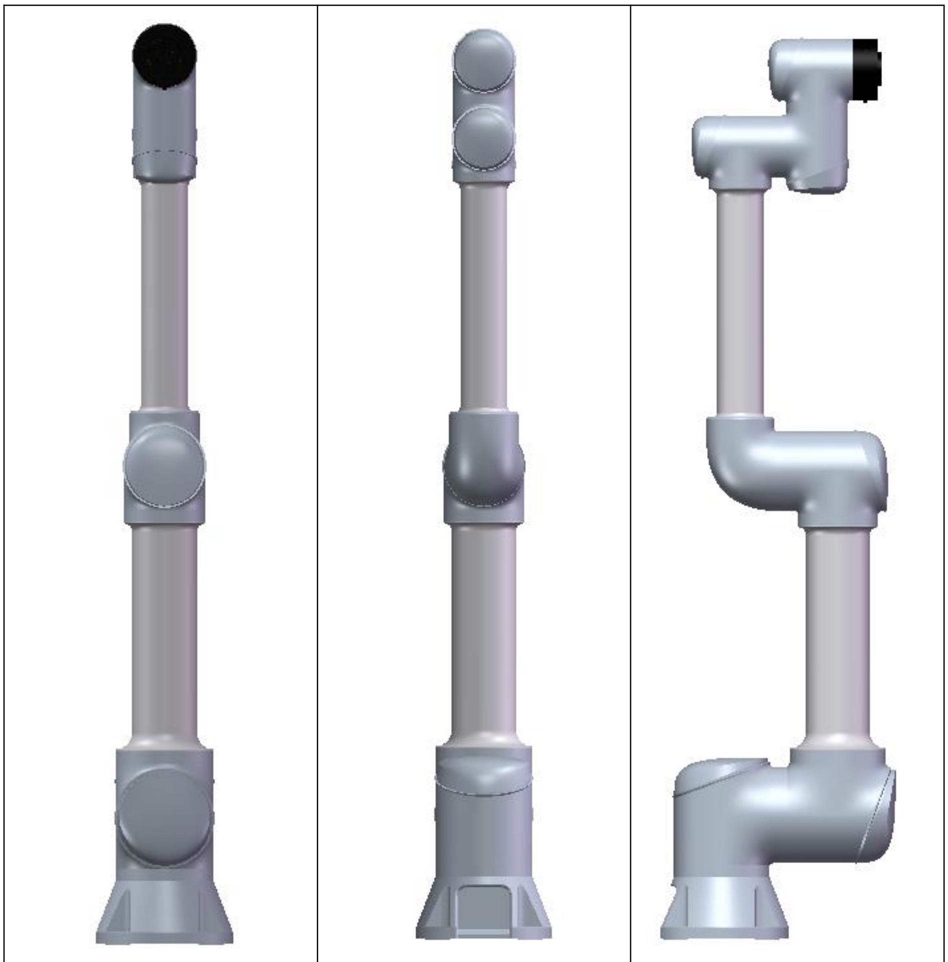
The following table shows the stop distance and stop time when stop type is set to stop 0. The data applies for the following configurations:

- Scope of action = 100 %
- Percentage of velocity, POV = 100 %
- Mass, m = Maximum load

| Axis | Stop distance(deg) | Stop time(ms) |
|---|---|---|
| **A1** | 18.1 | 218 |
| **A2** | 27.5 | 290 |
| **A3** | 26.4 | 288 |

## 4.4 Nameplates and Labels

The following nameplates and labels are attached to the robot and control box. It is not allowed to remove or unrecognized it. Unrecognized nameplates and labels must be replaced.



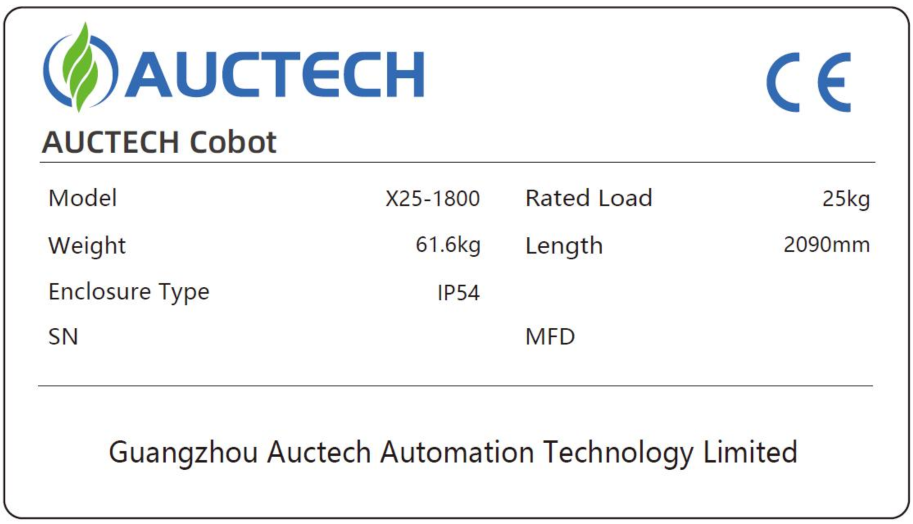
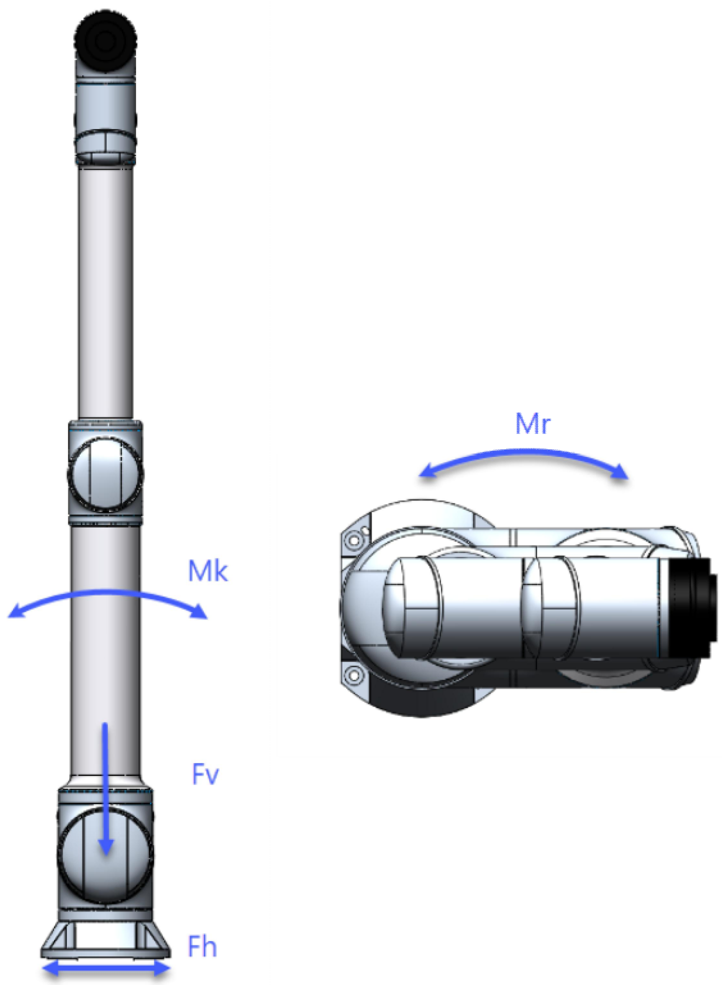



图 4- 3 Nameplates and labels

## 4.5 Mechanical Installation

### 4.5.1 Base Data

The specific forces and moments required to mount the base are given below, the robot's load and inertial force (weight) are included.




Front View Top View

Figure 4- 3 Robot base installation

| Force type | Force/moment |
|---|---|
| **Vertical force, Fv** | 1160 N |
| **Horizontal force, Fh** | 1212 N |
| **Tilting moment, Mk** | 875 Nm |
| **Axis 1 moment, Mr** | 915 Nm |

| | |
|---|---|
| ⚠Warning | ● **The base load illustrated in the table is the maximum load that appears. These data must be used when calculating the pedestal load and must be considered for safety reasons. Failure to consider these precautions could result in personal injury or property damage.** |

### 4.5.2 Base module Installation

The robot body is fixed by four M10 bolts through four 11mm screw holes on the base. 80N・m torque is recommended to be used to fix these bolts. Please install the robot with 2 pins through Ø6 pin holes on the base, if needed. The detailed information of installation holes on base is shown in the following figure.

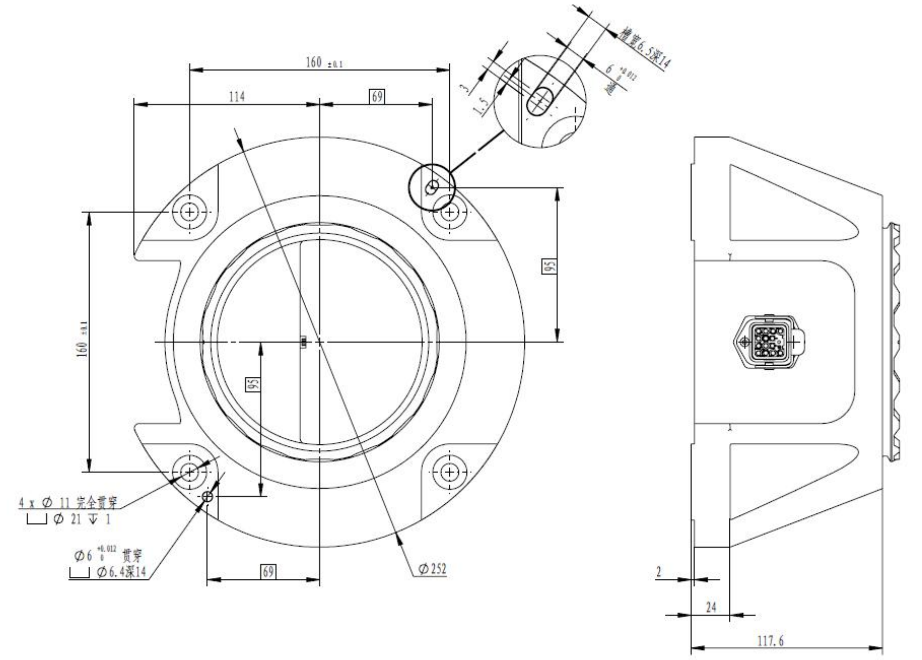


Figure 4- 4 Installation holes on base module of robot（Unit: mm）

The robot must be setup on a solid surface, which is able to tight with 10 time maximum joint inertia or 5 times robot weight. In addition, the vibrational surface is not recommended. While the robot is installed on the moving plate, the overall acceleration should be as low as possible. High accelerated place may accidentally stop the robot since the robot may report as collision detected.

| | |
|---|---|
| ⚠ Danger | ● **Make sure the robot has been fully installed. The installation surface must be vibration free.** |

## 4.5.3 Tool Flange Data

**Basic data**

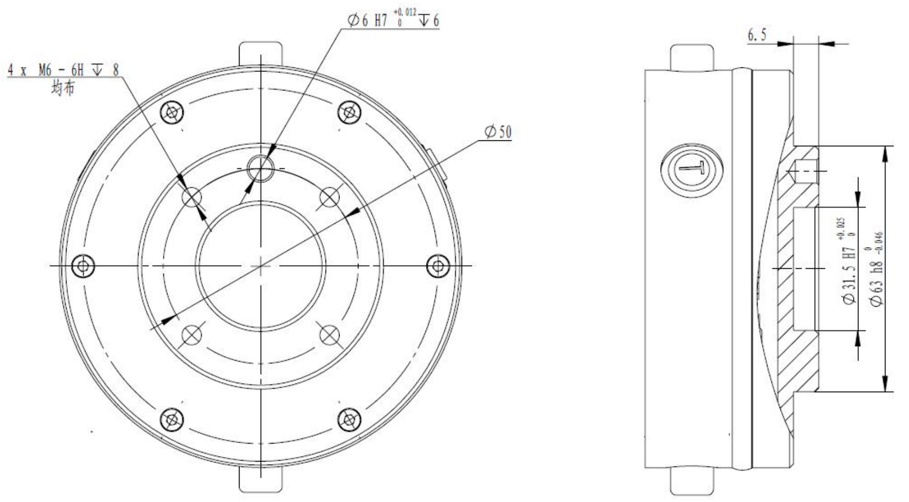



Figure 4- 5 Tool Flange

| | |
|---|---|
| **Load** | 25 kg |
| **EMC Resistance** | EN 61000-6-2 and EN 61000-6-4 |
| **IP code** | IP 54 |
| **Bolt level** | 12.9 |
| **Bolt size** | M6 |
| **Standards** | GB/T 14468.1-50-4- M6<br>ISO 9409-1-50-4-M6 |

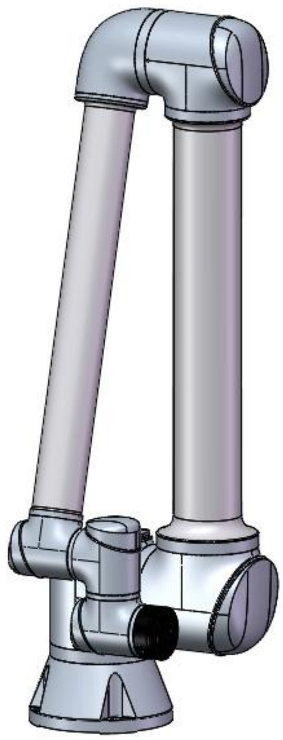
## 4.5.4 Tool Flange Installation

The tool flange of the robot has four M6 threaded holes for connecting the tool to the robot 15N•m torque is recommended to be used to fix these threaded holes. If it is necessary to install the tool with high accuracy, fixing the tool with pins through Ø6 pin holes that can be drilled is a feasible manner.

| | |
|---|---|
| Danger | ● **Make sure to select correct tools and the robot has been fully installed.**<br>● **Make sure the tool architecture is safe, there is no risk of accidental fall of parts.** |

## 4.5.5 Packaging Pose

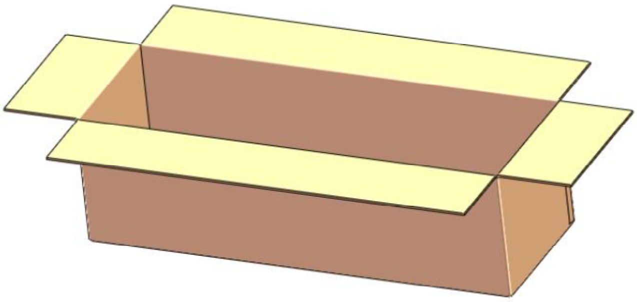
Before packaging, the robot requires to move to packaging position. The packaging position is defined as below:



| Joint | Angle（°） |
| --- | --- |
| J6 | 0° |
| J5 | 0° |
| J4 | 15° |
| J3 | 165° |
| J2 | 0° |
| J1 | 0° |

## 4.5.6 Packaging Size

The packaging box size provided is as follows.



The reference dimension of mechanical arm：1295×540×515 70kg

DSC30D Packaging box size： 480×395×376mm 20kg（D30D-J9）

# 5 Transportation and storage

## 5.1 Transportation

### 5.1.1 Preconditions

**Robot:**

Maintaining the original packaging during transport, the packaging materials stored in a dry place. It may be necessary to pack and move the robot afterwards. Move the robot from the packaging material to the installation position while lifting the robot link. Hold the robot until all the bolts on the base of the robot are securely fastened. The entire transport process, the robot installation process, the robot should be kept packaged pose.

**Control system**

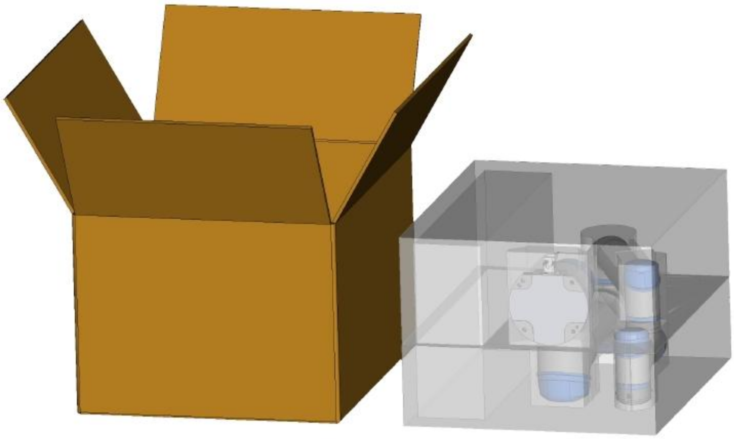
During transportation and placement, the control box should keep vertical. The transport process should avoid any vibration and collision, so as to avoid damage to the control system.

| | |
|---|---|
| Warning | ● Be sure to strictly observe the installation instructions in chapter 5 when installing the robot. |

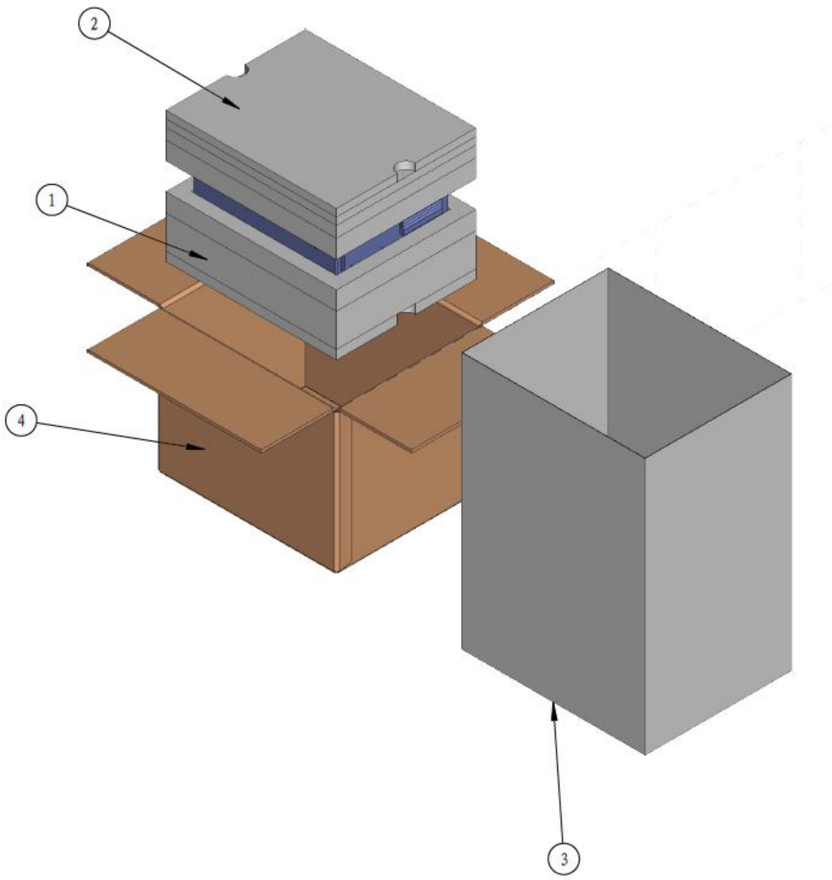
### 5.1.2 Robot Packaging

The packaging steps are as follows:

1. Loosen and unplug any external tools and peripherals.
2. Move the robot to the packing pose and turn off the power of the robot.
3. Loosen and disconnect the robot and control cabinet.
4. Pull out the grounding safety lead and remove the mounting screws.
5. Clean and dry the robot.
6. Place the robot in the box.
7. Pack the robot and control box into the designated box, making sure that the robot and control box are oriented correctly.



**Robot packaging**




**Control box packaging**

# 5.2 Storage

## 5.2.1 Preconditions

The following should be considered before long time storage：

- Storage location should be dry and dust-free
- Avoid temperature fluctuations
- Avoid condensation water
- Avoid direct sunlight
- Avoid air flow
- Choose a reasonable storage temperature range
- Choose a location that will not damage the packaging
- The robot control system requires to storage in the enclosed space

## 5.2.2 Procedure

The procedure illustrates as below:

1. Release and unplug the peripherals connector.
2. Move the robot to the packing position and turn off the robot.
3. Release and disconnect both robot and control box.
4. Pull out the ground safety leads and remove the mounting screws.
5. Clean and dry the robot.
6. Put the robot in the box.
7. Prepare the robot for storage.

### 5.2.3 Operation of the robot after long-term storage

The joints of the robot are partially sealed and self-lubricating (no need to replace or add grease during the service life) by using harmonic gear technology. During normal operation, lubricating oil is naturally distributed around gears and bearings to maintain normal lubrication of the mechanical system.

When the robot is stored or stopped for more than one month, or the joint movement is in a very small range for a long time, it is recommended to take the following measures periodically, which will keep the service life of the robot.

1. Please place the robot at room temperature before switching on the power supply (if the robot storage in a cold environment);
2. Switch on the power supply of the robot and keep it in a static state for 30min, which will enable the robot to reach its internal working temperature and soften the grease;
3. In manual mode, slowly move all joints without loading any payload or tools;
4. Create a program to move all joints slowly and continuously for at least 20 minutes (default acceleration is recommended, with a speed set around 10°/s, and rotate the joints as wide as possible).

# 6 Maintenance and repair

All maintenance instructions in this manual must be strictly observed.

Maintenance, calibration, repair must be based on the latest service manual.

## 6.1 Safety Instructions

After maintenance, you must verify the system's security level. Check with valid standards and safety laws and regulations. All safety functions should also be tested to ensure proper operation.

The purpose of maintenance and repair is to ensure the general operation of the system, or in the event of a fault, to help the system to resume general operation. Maintenance includes troubleshooting and actual maintenance.

Maintenance and repair includes:

**Prerequisites for maintenance:**

- The robot must be shut down and have protective measures against accidental restart.
- Remove the main input cable to ensure complete power down and disconnection of other energy sources. Take precautionary measures to prevent the system energy from being switched back on during maintenance.
- Before restarting the system, check whether the ground connection is valid.
- Wait for 5 minutes until the intermediate circuit is fully discharged. Avoid splitting the power supply in the control box. After the control box is closed, its power supply system can still keep high pressure for several hours.
- Disassemble the robot or control box according to the ESD guidelines.
- Pneumatic systems are part of the system that is independent of the robot and the fixture. After the main power of the robot is turned off, the air pressure still exists. The robot must be powered off and the pressure released before installing or repairing the fixture.

**Precautions:**

- Do not change any information in the software security configuration (such as force limitation). Security configuration is described in the manual. If the safety parameters have been modified, the entire robot system should be considered a new system, which means that all safety audits, such as risk assessment, must be updated.
- Replace defective parts with new parts of the same part number or with approved equivalent parts.
- Reactivate any disabling safety measures immediately after maintenance is completed.
- Record all maintenance operations in writing and save them in the relevant technical documentation of the entire robot system.

## 6.2 Maintenance

After the completion of equipment commissioning, maintenance should be carried out in accordance with the provisions of the maintenance period.

**Maintenance Term Regulations Form**

| **Maintenance activities** | **Period Maintenance** | **Every 1 month** | **Every 6 month** | **Every 12 month** | **Every 36 month** | **Reference Documents** |
|---|---|---|---|---|---|---|
| Cleaning activities | | | | | | |
| Clean the control box (Replace the filters) | **X** | | | | | |
| Clean the robot | **X** | | | | | |
| Check activities | | | | | | |
| Check the robot (Check the connection bolts of the robot base, covers, tools and every joint flange and no grease leakage) | **X** | **X** | | | | |
| Check the information label and nameplate | **X** | | | **X** | | |
| Check the cable harness | **X** | | **X** | | | |
| Check plastic parts and pads | **X** | **X** | | | | |
| Check the signal light | **X** | | | **X** | | |
| Check the emergency stop | **X** | **X** | | | | |

**Period maintenance:**

It is referring to the regular implementation of the relevant maintenance. The actual interval depends on the robot's operating period, work environment and sports mode. In general, the shorter the operating period; the more serious the work environment pollution; the more rigorous exercise mode, the shorter the interval of regular maintenance should be.

When performing a job on the maintenance list, a visual inspection must be carried out based on the following points:

- Check the safety device, plug connection and printed circuit board is securely installed;
- Check the label, nameplate is clear and unspoiled;
- Check if the cable is damaged;
- Check the connection of the ground potential equalization lead;
- Check all equipment components for wear or damage.

### 6.2.1 Robot Cleaning

The dust/dirt/oil on the robot surface can be wiped off with a clean cloth and water or 10% ethanol. In some extreme cases, very small amount of grease can be visible from the joint, which does not affect the function and lifetime of the joint.

### 6.2.2 Control Box Cleaning

The control box contains is equipped with a fan and two IP44 filters on two sides, which is mainly used for heat dissipation inside the control box.

**Note Adjust the direction of the fan dust cover for different control cabinets. Otherwise, the IP protection level will be affected.**

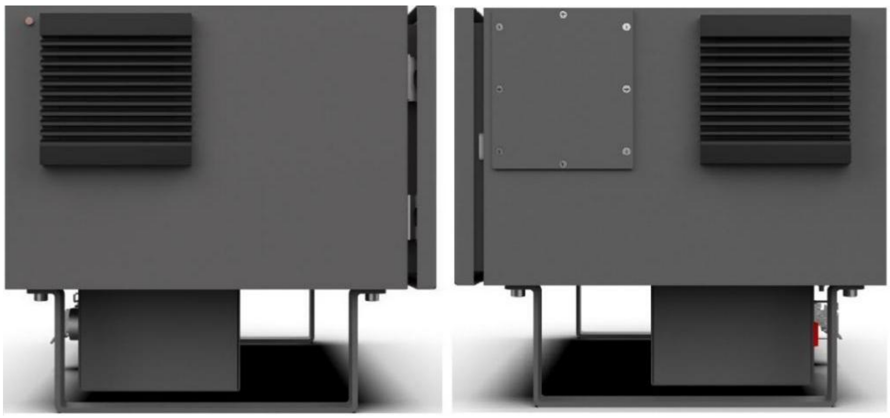


Figure 6- 1 Control box Filter

Fan filter cleaning steps：

1) As shown in following figure, there are two gaps in the red box. Insert a small flat-head screwdriver into the gap and pry outward. Remove the dust cover when it becomes loose.

2) Take out the filter, and confirm to use low pressure gas cleaning or directly replace the filter screen according to the actual situation of the filter screen. When cleaning the filter screen, it is necessary to clean the front and back sides repeatedly to ensure that the filter screen is cleaned thoroughly.

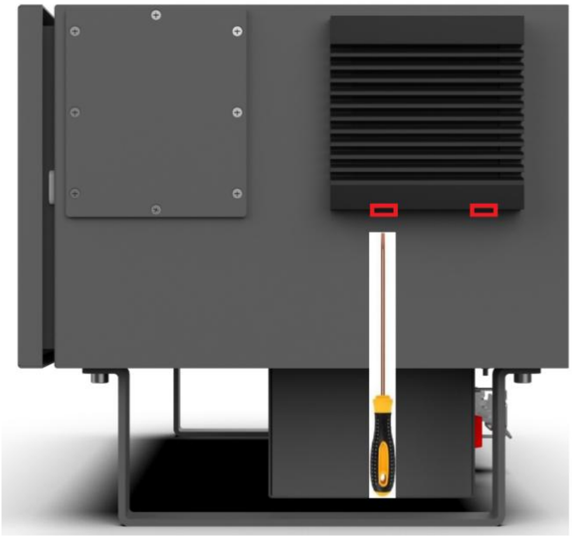


Figure 6- 2 Fan filter cleaning

## 6.3 Repair

Only trained users should allow for repairs on the robot controller. Repairs within equipment components should only be carried out by professionally trained personnel. Maintenance must be based on the latest service manual.

| | |
|---|---|
| Warning | ● Maintenance must be performed by an authorized system integrator or robot manufacturer. |

# Appendix A Reference

The following listed is reference：

| Standard No. | Description |
|---|---|
| GB 5226.1 | Electrical safety of machinery |
| GB/T 15706 | Safety of machinery – general principles for design<br>Risk assessment and risk reduction |
| GB 11291.1 | Robots for industrial environments- safety requirements |
| GB 11291.2 | Robots and robotic devices-Safety requirements for industrial robots |
| GB/T 17799.2 | Electromagnetic compatibility – Generic standards- Immunity for industrial environments |
| GB 17799.4 | Electromagnetic compatibility (EMC) – Generic standards – Emission standard for industrial environments |
| GB 16754 | Safety of machinery – Emergency stop- Principles for design |
| GB/T 16855.1 | Safety of machinery – Safety-related parts of control systems |

| Standard NO. | Description |
|---|---|
| ISO 13849-1 | Safety of machinery — Safety-related parts of control systems — Part 1:General principles for design |
| ISO 13849-2 | Safety of machinery —Safety-related parts of control systems<br>Part 2: Validation |
| ISO 13850 | Safety of machinery – Emergency stop – Principles for design |
| ISO 12100 | Safety of machinery – General principles for design – Risk assessment and risk reduction |
| ISO 10218-1 | Robots and robotic devices – Safety requirements for industrial robots Part 1: Robots |
| ANSI/RIA R15.06 | Industrial Robots and Robot Systems – Safety Requirements |
| CAN/CSA Z434-14 | Industrial Robots and Robot Systems – General Safety Requirements |

| | |
|---|---|
| IEC 61000-6-2 | Electromagnetic compatibility (EMC)<br>Part 6-2: Generic standards - Immunity for industrial environments |
| IEC 61000-6-4 | Electromagnetic compatibility (EMC)<br>Part 6-4: Generic standards - Emission standard for industrial environments |
| IEC 61326-3-1 | Electrical equipment for measurement, control and laboratory use - EMC requirements |
| IEC 60947-5-5 | Low-voltage switchgear and controlgear<br>Part 5-5: Control circuit devices and switching elements - Electrical emergency stop device with mechanical<br>latching function |
| IEC 60529 | Degrees of protection provided by enclosures (IP Code) |
| IEC 60320-1 | Appliance couplers for household and similar general purposes<br>Part 1: General requirements |
| ISO 9409 | Manipulating industrial robots － Mechanical interfaces<br>Part 1: Plates |
| IEC 61140/A1 | Protection against electric shock － Common aspects for installation and equipment |
| IEC 60068-2-1 | Environmental testing<br>Part 2-1: Tests - Test A: Cold |
| IEC 60068-2-2 | Environmental testing<br>Part 2-2: Tests - Test B: Dry heat |
| IEC 60068-2-27 | Environmental testing<br>Part 2-27: Tests - Test Ea and guidance: Shock |
| IEC 60068-2-64 | Environmental testing<br>Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance |
| IEC 61784-3 | Industrial communication networks － Profiles<br>Part 3: Functional safety fieldbuses － General rules and profile definitions |
| IEC 60204-1/A1 | Safety of machinery － Electrical equipment of machines<br>Part 1: General requirements |
| IEC 60664-1 | Insulation coordination for equipment within low-voltage systems<br>Part 1: Principles, requirements and tests |
| IEC 60664-5 | Insulation coordination for equipment within low-voltage systems<br>Part 5: Comprehensive method for determining clearances and creepage distances equal to or less than<br>2 mm |
| ISO 9787 | Manipulating industrial robots, coordinate systems, and motion nomenclatures |
| ISO 9283 | Manipulating industrial robots, performance criteria, and related test methods |
| EN 614-1 | Safety of machinery - Ergonomic design principles - Part 1:Terminology and general principles |
| ANSI/UL 1740 | Safety standard for robots and robotic equipment |

# Guangzhou Auctech Automation Technology Ltd

**Add:** Hongshi Business Building, 11 Kehua Road, SCI-TECH Industry Park, Taihe Town, Baiyun District, Guangzhou, CHINA

**Tel:** +86 20 84898493

**E-mail:** info@auctech.com.cn

**Web:** www.auctech.com.cn