

# SR Series Robot Instruction Manual

Product Series: Full range of SR series

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## Foreword

Before using the robot, read carefully the instruction manual of the STEP Robot and use the robot on the base of understanding this manual.

Without prior permission from our company, no information in this manual can be copied and transmitted. All the parameters and designs in this manual are subject to further revision without prior notice.

### Abstract

This manual provides complete and comprehensive description about the installation, use, parameter setting and maintenance of SR series robot. This manual can be used as the reference document by system integrators when they use our company's SR series robot for the system design of user workstation or as the guidance for system installation, commissioning and maintenance.

In order to ensure proper installation and use of SR series robot, you shall read this manual carefully before using the robot.

### Target Readers

System integrator

Onsite technical support staff

Equipment maintenance personnel

After sales service personnel

### Contents

This manual is subject to supplementation and change. Check our website for any updates. Our website: [www.steprobots.com](http://www.steprobots.com).

### Main Features

- a) Compact structure;
- b) Large working range;
- c) Fast operation speed;
- d) Excellent general performance;
- e) Modular structure design.

### Descriptions of safety-related marks

The manual includes relevant safety notes for ensuring personal safety and preventing system damage. They are labeled with "Danger", "Caution" or "Important" based on their importance. Before using the robot, the user shall be familiar with the safety notes and strictly follow them.



## **Danger**

It may cause hazardous conditions or personal death if it is used improperly.



## **Caution**

It may cause danger, minor or serious personal injury and equipment damage if it is used improperly.



## **Important**

The part that the user needs to observe and pay attention.

**Chapter I Notice for Use****Chapter II Technical Data****Chapter III Handling and Installation****Chapter IV Maintenance**

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# Chapter I Notice for Use

## 1.1 Scope of Application


The robot is mainly used in welding, handling, stacking and other applications where manual operation is replaced totally or partially.

## 1.2 Unpacking Inspection



# Caution

© The robot with damage or missing parts shall not be installed.  
Otherwise there is danger for major accident or personal injury.



# Caution

© Read “Safety Instructions for Use of Robot” before using the robot.  
Otherwise there is danger for major accident or personal injury.

During unpacking, check if there is any damage from shipping and the model and specifications on the nameplate are consistent with the order requirements. If any model discrepancy or parts missing is found, contact the manufacturer or supplier immediately.

## Chapter II Technical Data

### 2.1 Robot structure diagram

The SR20 robot structure is shown in fig.2-1.

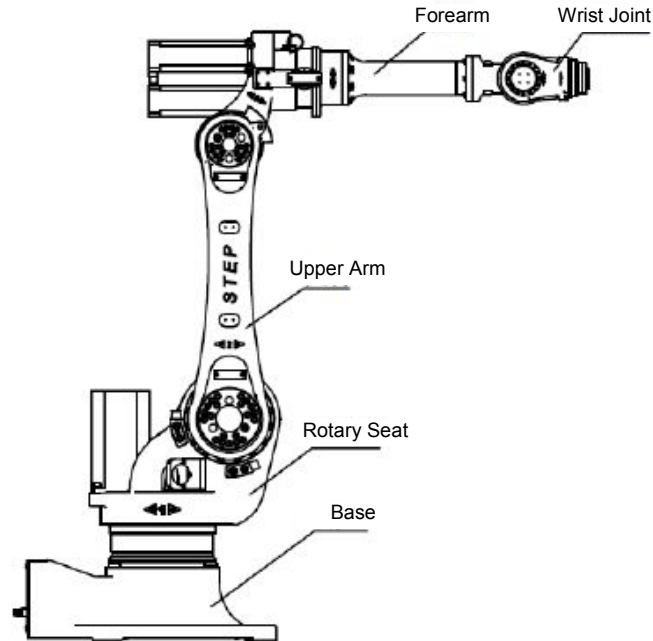


Figure 2-1 SR20 Robot Structure

SR18L8 robot structure is shown in fig. 2-2.

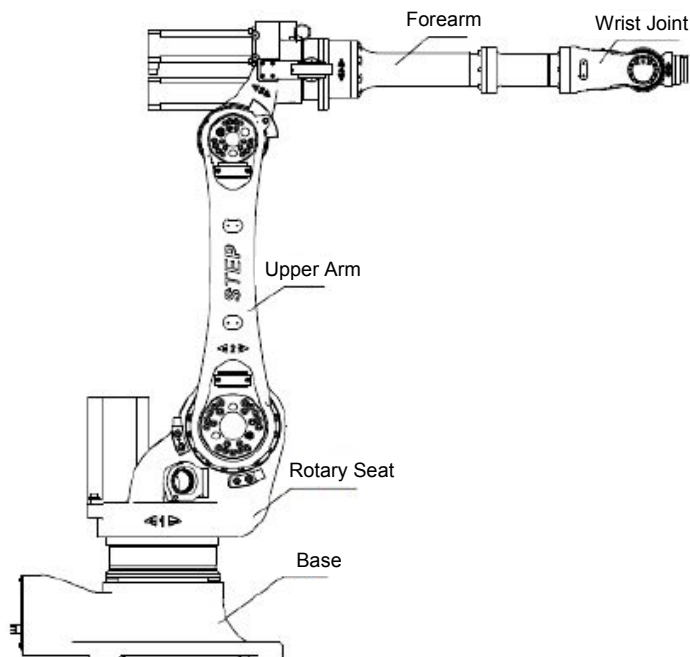


Figure 2-2 SR18L8 Robot Structure

SR25 robot structure is shown in fig.2-3.

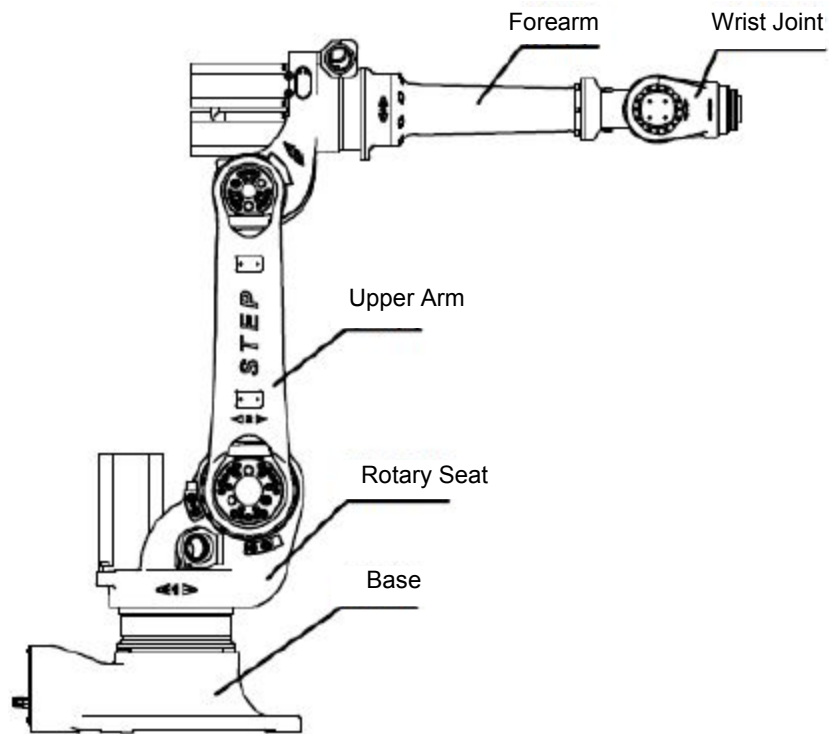


Figure 2-3 SR25 Robot Structure

SR50 robot structure is shown in fig.2-4.

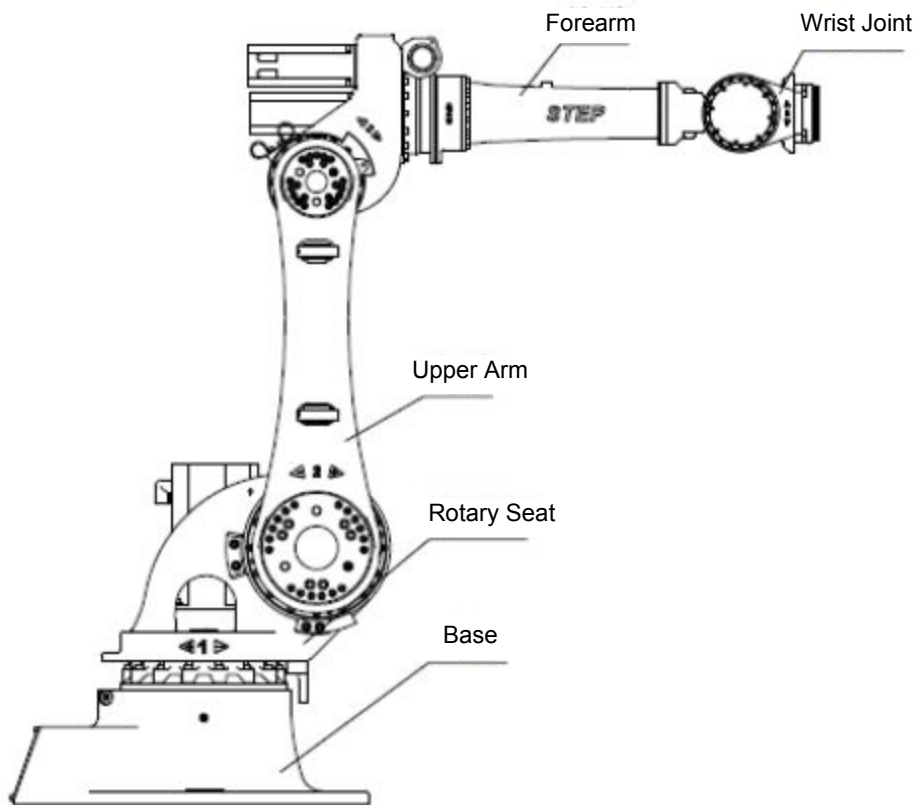


Figure 2-4 SR50 robot structure

SR165 robot structure is shown in fig. 2-5.

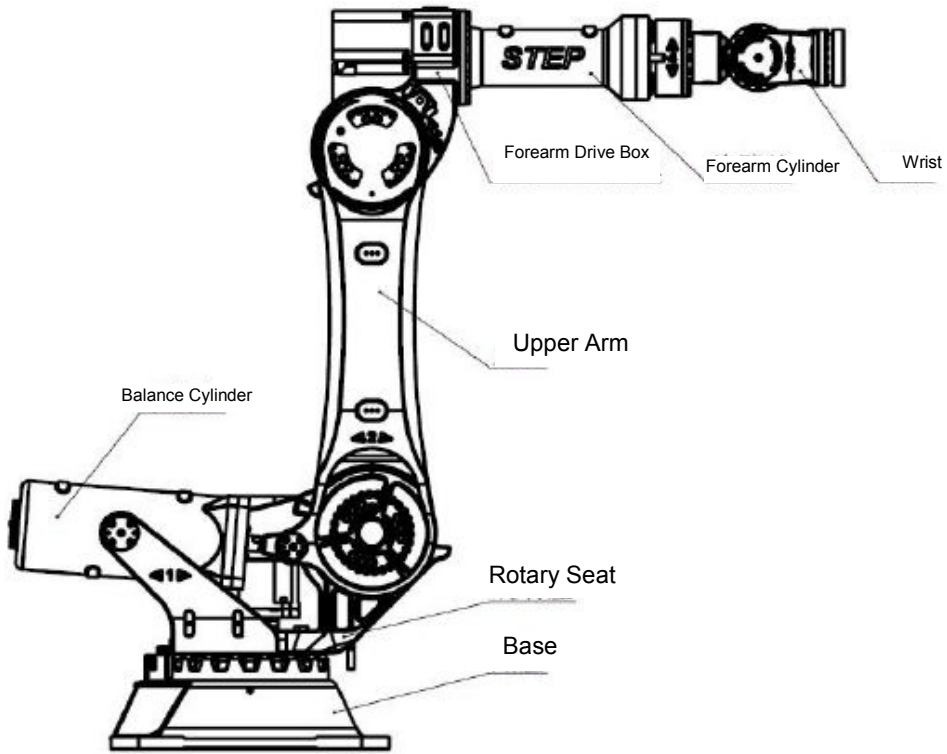


Figure 2-5 SR165 Robot Structure

SR210 robot structure is shown in fig.2-6

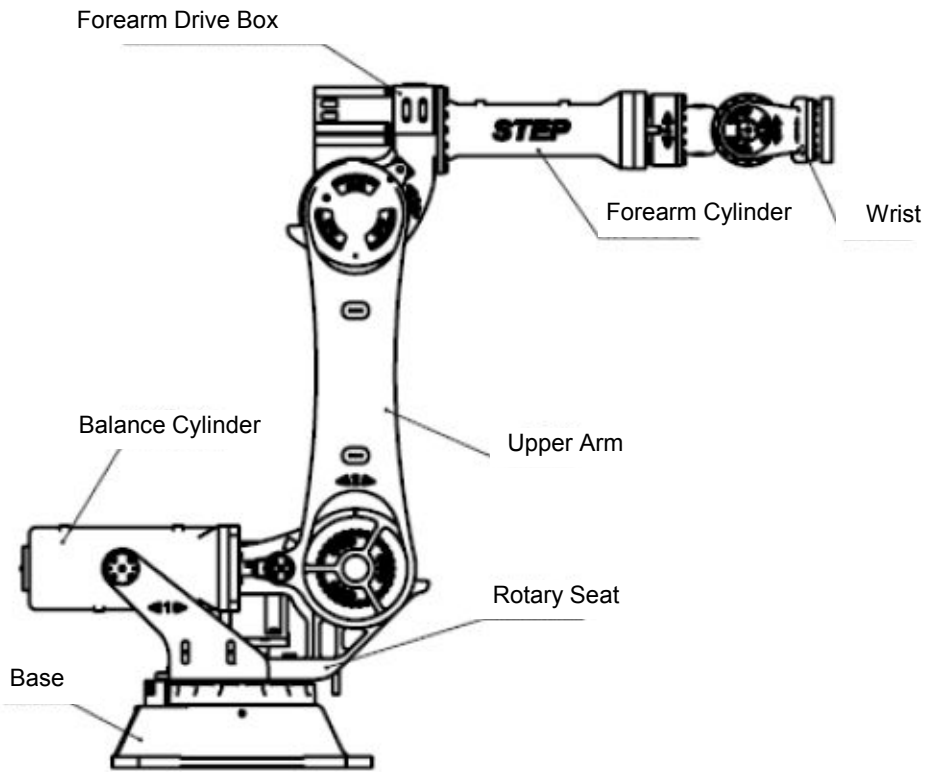


Figure 2-6 SR210 Robot Structure

## 2.2 Mechanical data

SR18 robot's mechanical data is listed in table 2-1.

Table 2-1 SR18 Robot's Mechanical Data

Model	SR20
Max. payload weight (wrist joint) (kg)	20
Max. turning radius (mm)	1588
Total weight (kg)	240

SR18L8 robot's mechanical data is listed in table 2-2.

Table 2-2 SR18L8 Robot's Mechanical Data

Model	SR18L8
Max. payload weight (wrist joint) (kg)	8
Max. turning radius (mm)	1824
Total weight (kg)	238

SR25 robot's mechanical data is listed in table 2-3.

Table 2-3 SR25 Robot's Mechanical Data

Model	SR25
Max. payload weight (wrist joint) (kg)	25
Max. turning radius (mm)	1790
Total weight (kg)	288

SR50 robot's mechanical data is listed in table 2-4.

Table 2-4 SR50 Robot's Mechanical Data

Model	SR50
Max. payload weight (wrist joint) (kg)	50
Max. turning radius (mm)	2110
Total weight (kg)	510

SR165 robot's mechanical data is listed in table 2-5.

Table 2-5 SR165 Robot's Mechanical Data

Model	SR165
Max. payload weight (wrist joint) (kg)	165
Max. turning radius (mm)	2586
Total weight (kg)	1250

SR210 robot's mechanical data is listed in table 2-6.

Table 2-6 SR210 Robot's Mechanical Data

Model	SR210
Max. payload weight (wrist joint) (kg)	210
Max. turning radius (mm)	2687
Total weight (kg)	1250

### 2.3 Robot load data

SR20 robot's load data is listed in table 2-7.

Table 2-7 SR20 Robot's Load Data

Model	Wrist joint load (kg)	Forearm load (kg)	Upper arm load (kg)
SR20	20	10	10

SR20 robot's load location is shown in fig.2-7.

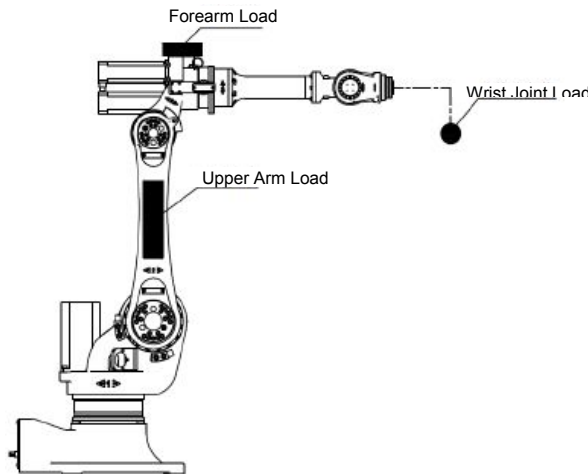


Figure 2-7 SR20 Robot's Load Location

The relationship between SR20's wrist load mass and center of gravity is shown in fig.2-8.

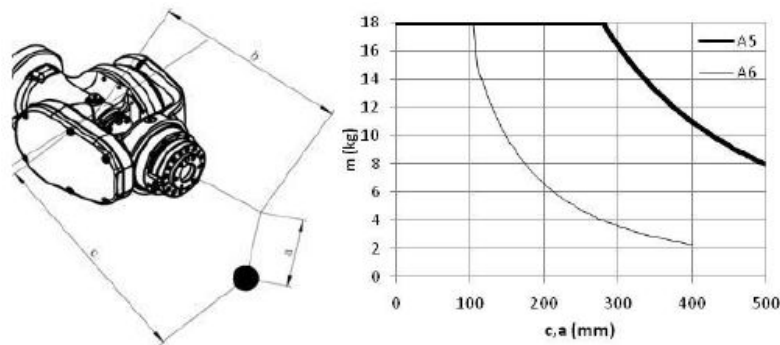


Figure 2-8 Relationship Between SR20's Wrist Load Mass and Center of Gravity

SR18L8 robot's load data is listed in table 2-8.

Table 2-8 SR18L8 Robot's Load Data

Model	Wrist joint load (kg)	Forearm load (kg)	Upper arm load (kg)
SR18L8	8	10	10

SR18L8 robot's load locations are shown in fig.2-9.

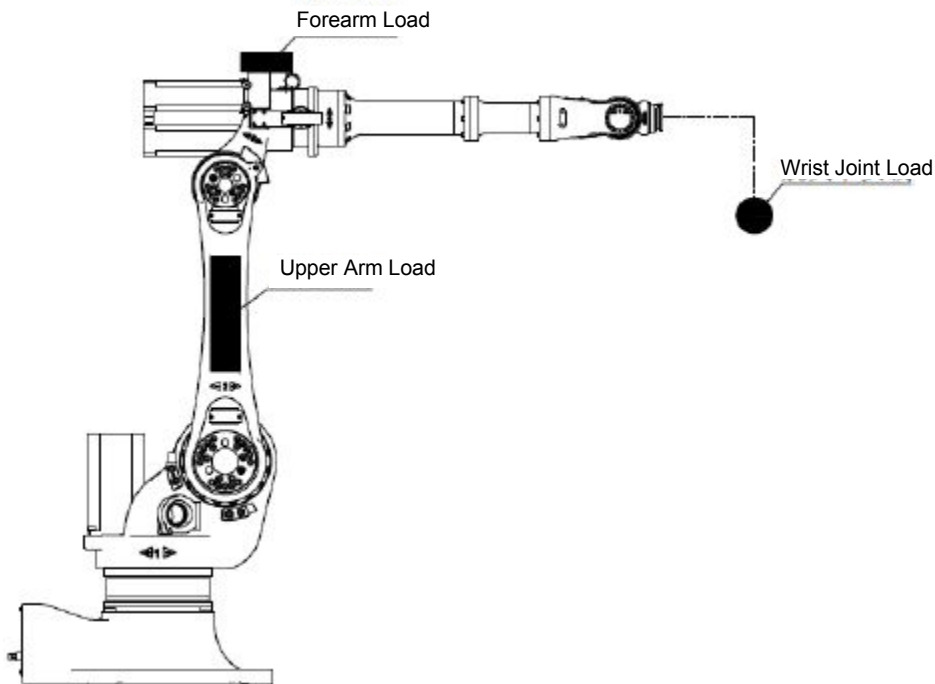


Figure 2-9 SR18L8 Robot's Load Location

The relationship between SR18L8's wrist load mass and center of gravity is shown in fig.2-10.

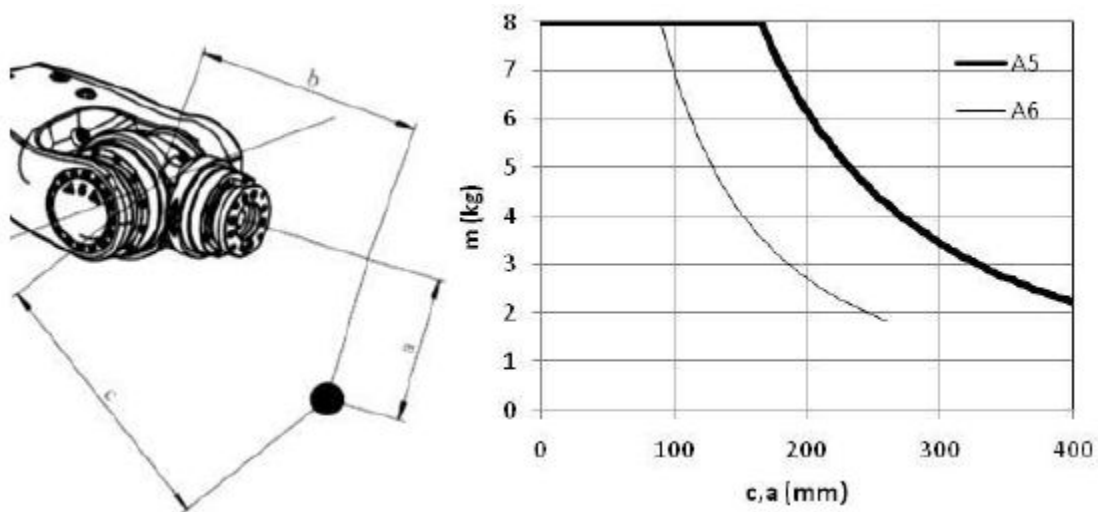


Figure 2-10 Relationship Between SR18L8's Wrist Load Mass and Center of Gravity

SR25 robot's load data is listed in table 2-9.

Table 2-9 SR25 Robot's Load Data

Model	Wrist joint load (kg)	Forearm load (kg)	Upper arm load (kg)
SR25	25	10	10

SR25 robot's load locations are shown in figure 2-11.

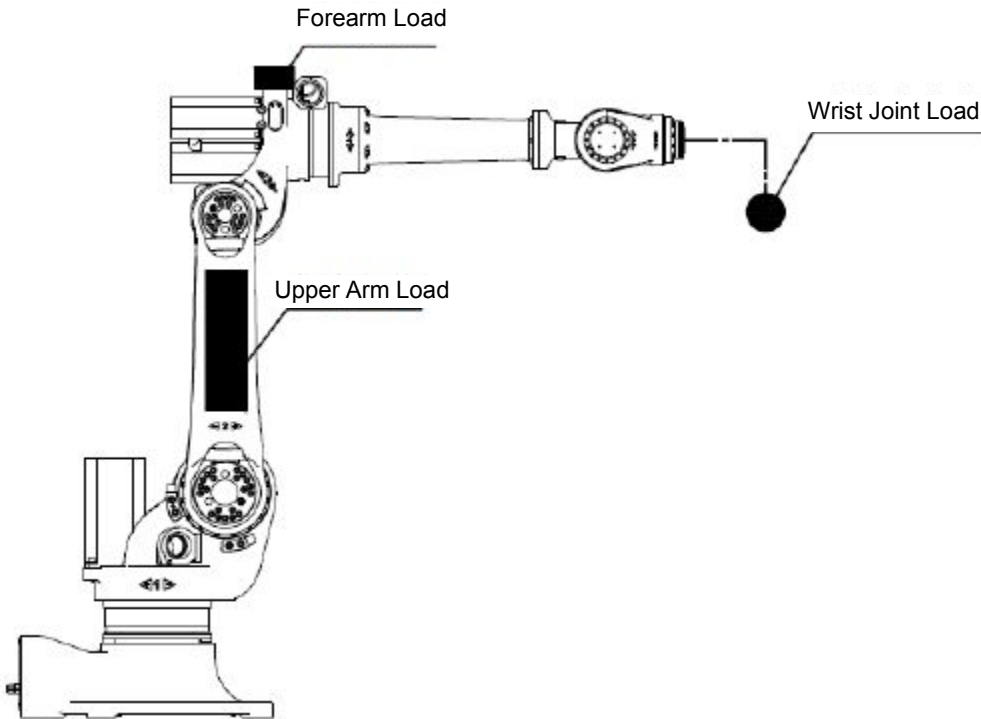


Figure 2-11 SR25 Robot's Load Location

The relationship between SR25 wrist load mass and center of gravity is shown in fig.2-12.

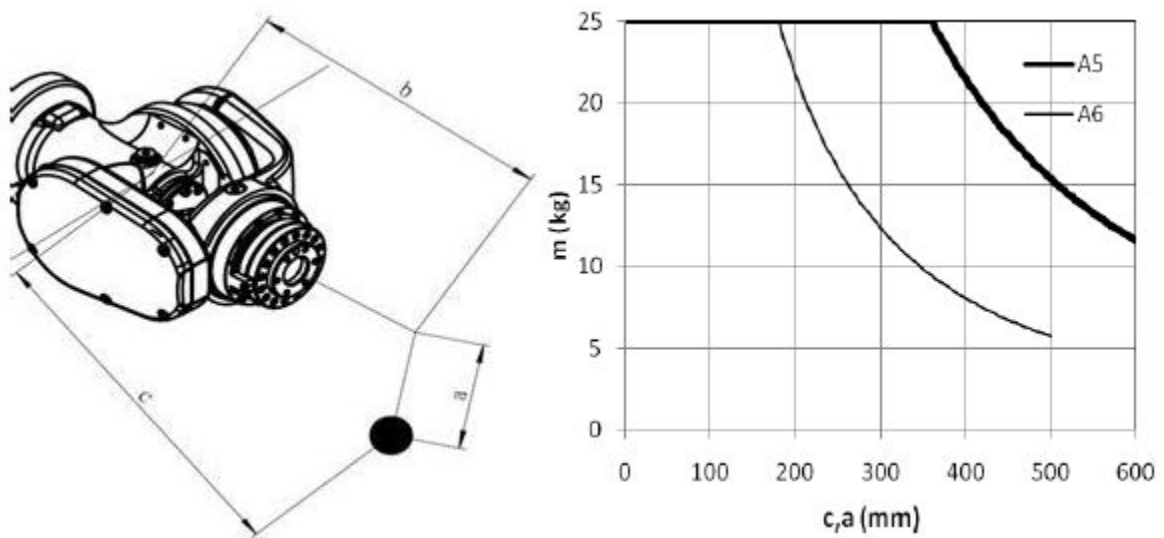


Figure 2-12 Relationship Between SR25 Wrist Load Mass and Center of Gravity

SR50 robot's load data is listed in table 2-10.

Table 2-10 SR25 Robot's Load Data

Model	Forearm load (kg)	Upper arm load (kg)
SR50	15	50

SR50 robot's load locations are shown in fig.2-13.

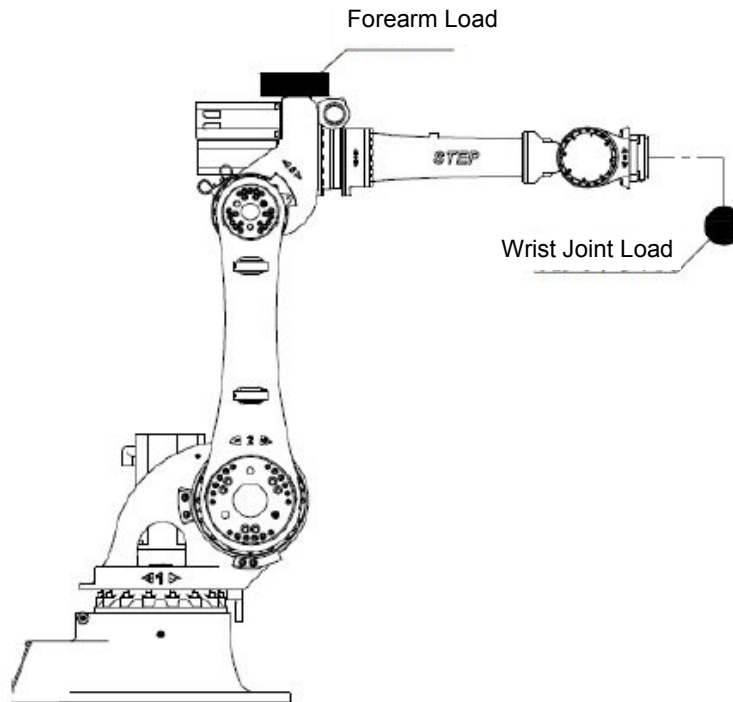


Figure 2-13 SR50 Robot's Load Location

The relationship between SR50's wrist load mass and center of gravity is shown in fig.2-14.

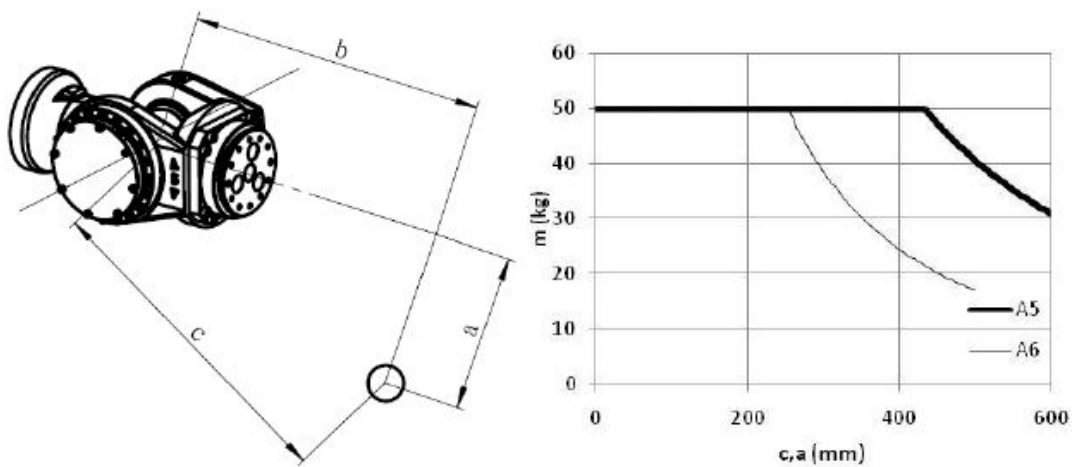


Figure 2-14 Relationship between SR50's Wrist Load Mass and Center of Gravity

SR165 robot's load data is listed in table 2-11.

Table 2-11 SR165 Robot's Load Data

Model	Wrist joint load (kg)	Drive box load (kg)
SR165	165	50

SR165 robot's load locations are shown in fig.2-15.

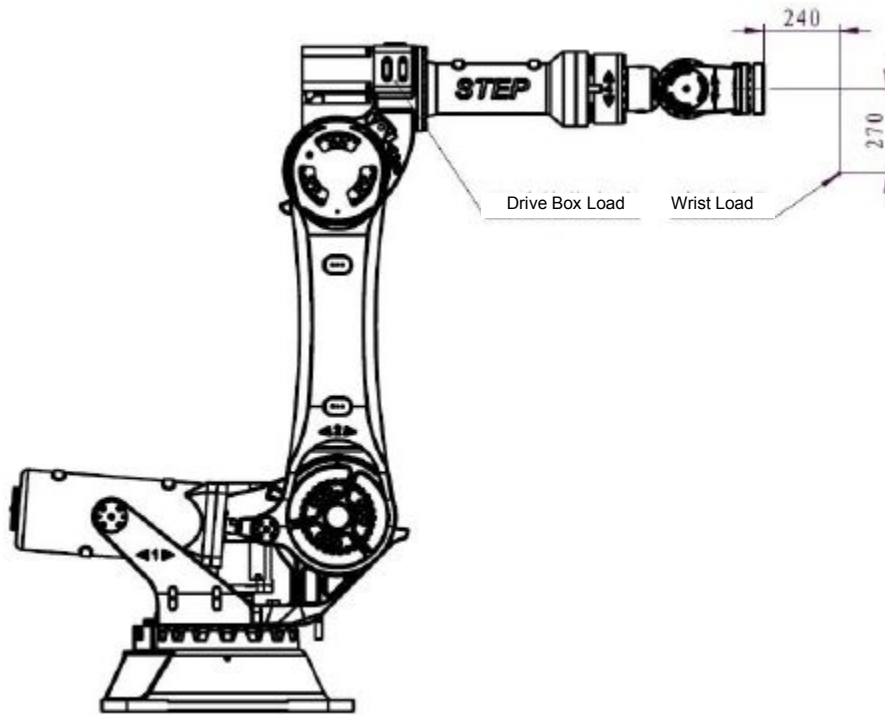


Figure 2-15 SR165 Robot's Load Location

The relationship between SR165's wrist load mass and center of gravity is shown in fig.2-16.

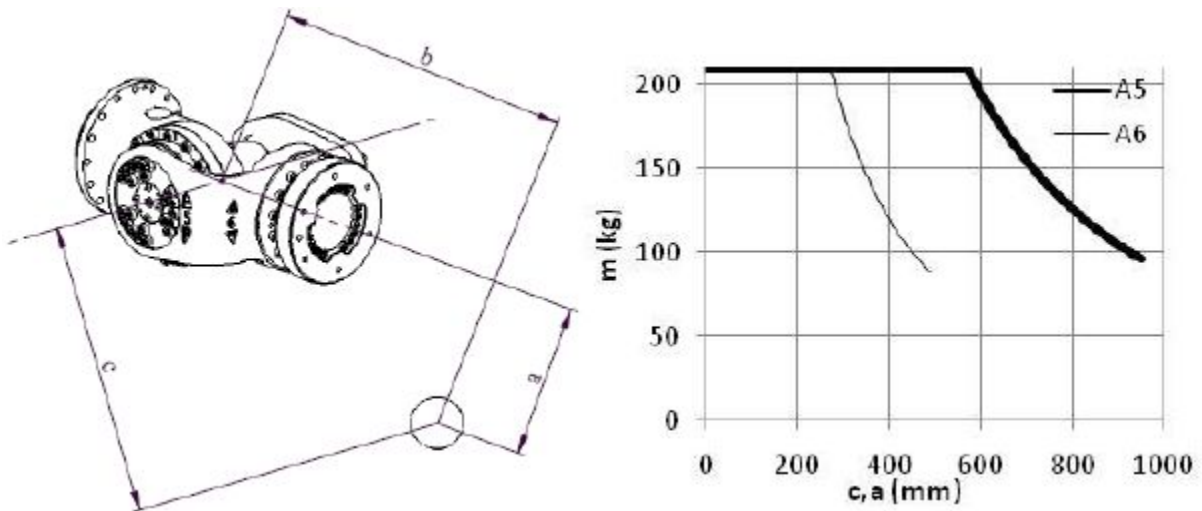


图 2-16 Relationship between SR165's Wrist Load Mass and Center of Gravity

SR210 robot's load data is listed in table 2-12.

Table 2-12 SR210 Robot's Load Data

Model	Wrist joint load (kg)	Drive box load (kg)
SR210	210	50

SR210 robot's load locations are shown in fig.2-17.

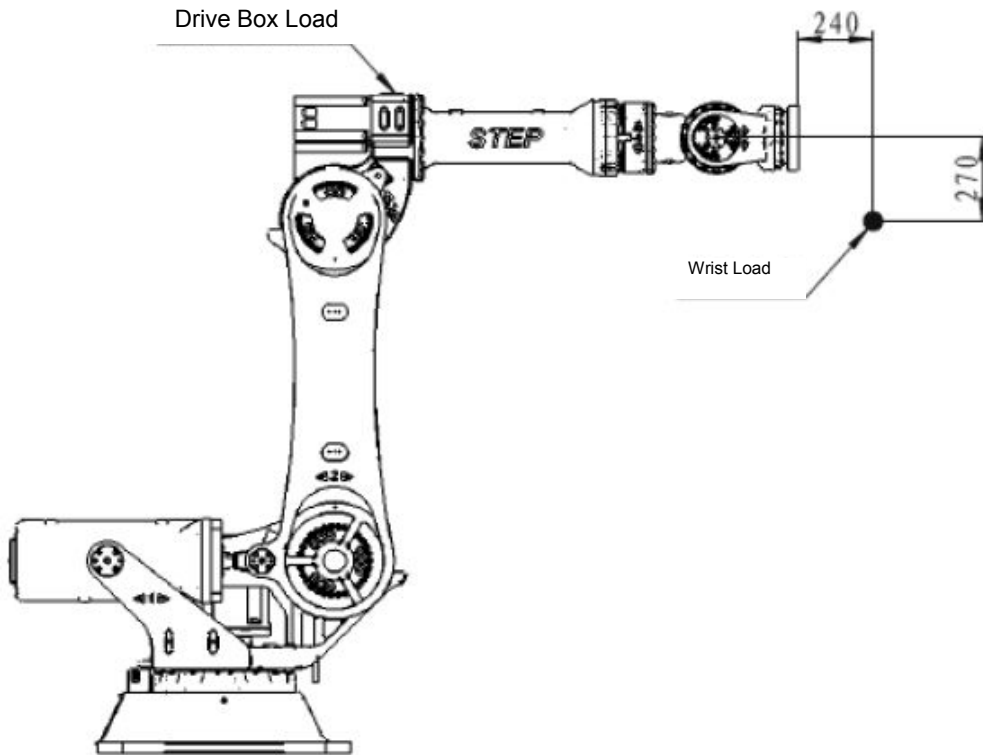


Figure 2-17 SR210 Robot's Load Location

The relationship between SR210's wrist load mass and center of gravity is shown in fig.2-18.

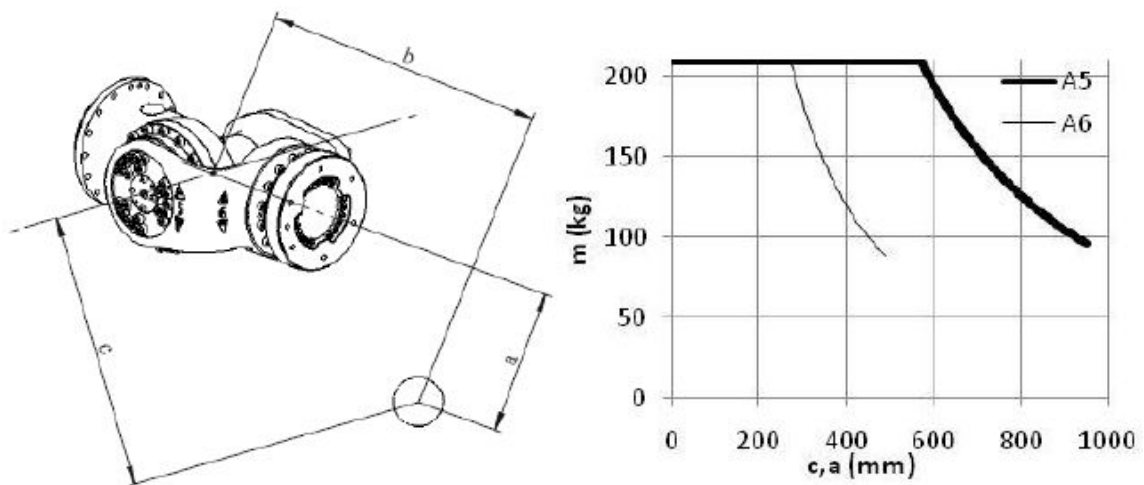


Figure 2-18 Relationship between SR210's Wrist Load Mass and Center of Gravity

## 2.4 Motion data

The motion data of each joint of SR20 robot (wrist load 20 kg) is shown in table 2-13.

Table 2-13 Motion Data of Each Joint of SR20 Robot

Joint	Rotation range (controlled by program)	Joint speed
J1	$\pm 165^\circ$	150°/S
J2	$+40^\circ \sim -155^\circ$	120°/S
J3	$+165^\circ \sim -100^\circ$	120°/S
J4	$\pm 360^\circ$	360°/S
J5	$\pm 120^\circ$	300°/S
J6	$\pm 360^\circ$	450°/S

The motion data of each joint of SR18L8 robot (wrist load 8 kg) is shown in table 2-14.

Table 2-14 Motion Data of Each Joint of SR18L8 Robot

Joint	Rotation range (controlled by program)	Joint speed
J1	$\pm 165^\circ$	150°/S
J2	$+40^\circ \sim -155^\circ$	120°/S
J3	$+165^\circ \sim -100^\circ$	120°/S
J4	$\pm 360^\circ$	400°/S
J5	$\pm 120^\circ$	320°/S
J6	$\pm 360^\circ$	450°/S

The motion data of each joint of SR25 robot (wrist load 25 kg) is shown in table 2-15.

Table 2-15 Motion Data of Each Joint of SR25 Robot

Joint	Rotation range (controlled by program)	Joint speed
J1	$\pm 165^\circ$	150°/S
J2	$+40^\circ \sim -155^\circ$	120°/S
J3	$+170^\circ \sim -70^\circ$	120°/S
J4	$\pm 360^\circ$	300°/S
J5	$\pm 120^\circ$	300°/S
J6	$\pm 360^\circ$	360°/S

The motion data of each joint of SR50 robot (wrist load 50 kg) is shown in table 2-16.

Table 2-16 Motion Data of Each Joint of SR50 Robot

Joint	Rotation range (controlled by program)	Joint speed
J1	$\pm 165^\circ$	120°/S
J2	$+40^\circ \sim -150^\circ$	100°/S
J3	$+165^\circ \sim -105^\circ$	100°/S
J4	$\pm 360^\circ$	180°/S
J5	$\pm 120^\circ$	180°/S
J6	$\pm 360^\circ$	200°/S

The motion data of each joint of SR165 robot (wrist load 165 kg) is shown in table 2-17.

Table 2-17 Motion Data of Each Joint of SR165 Robot

Joint	Rotation range (controlled by program)	Joint speed
J1	$\pm 165^\circ$	110°/S
J2	$-5^\circ \sim -140^\circ$	110°/S
J3	$+170^\circ \sim -60^\circ$	110°/S
J4	$\pm 360^\circ$	175°/S
J5	$\pm 125^\circ$	150°/S
J6	$\pm 360^\circ$	240°/S

The motion data of each joint of SR210 robot (wrist load 210 kg) is shown in table 2-18.

Table 2-18 Motion Data of Each Joint of SR210 Robot

Joint	Rotation range (controlled by program)	Joint speed
J1	$\pm 165^\circ$	95°/S
J2	$-5^\circ \sim -140^\circ$	85°/S
J3	$+170^\circ \sim -40^\circ$	95°/S
J4	$\pm 360^\circ$	125°/S
J5	$\pm 120^\circ$	125°/S
J6	$\pm 360^\circ$	190°/S

The motion of each joint of SR series robot is shown in fig.2-19.

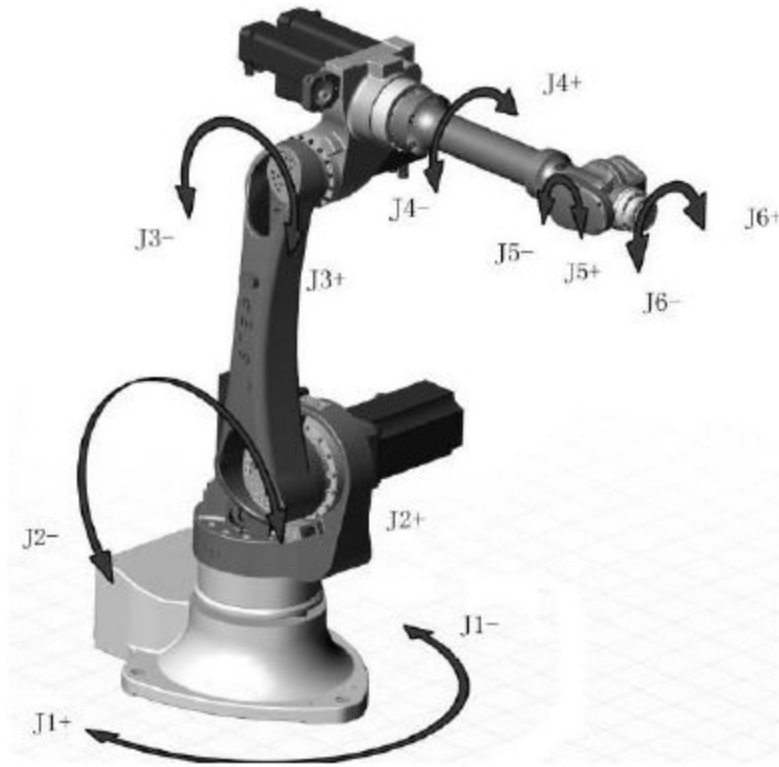


Figure 2-19 Motion of Each Joint of SR Series Robot

## 2.5 Working Space

This working space refers to the zero point and working range of mechanical system, which is slightly different with that defined in the mechanical system's instruction manual. The working space defined in mechanical system's instruction manual must be followed when using the robot, or else errors will occur.

The working space of SR20 robot is shown in fig.2-20. The mechanical CAD drawing can be downloaded from STEP's website: [www.steprobots.com](http://www.steprobots.com).

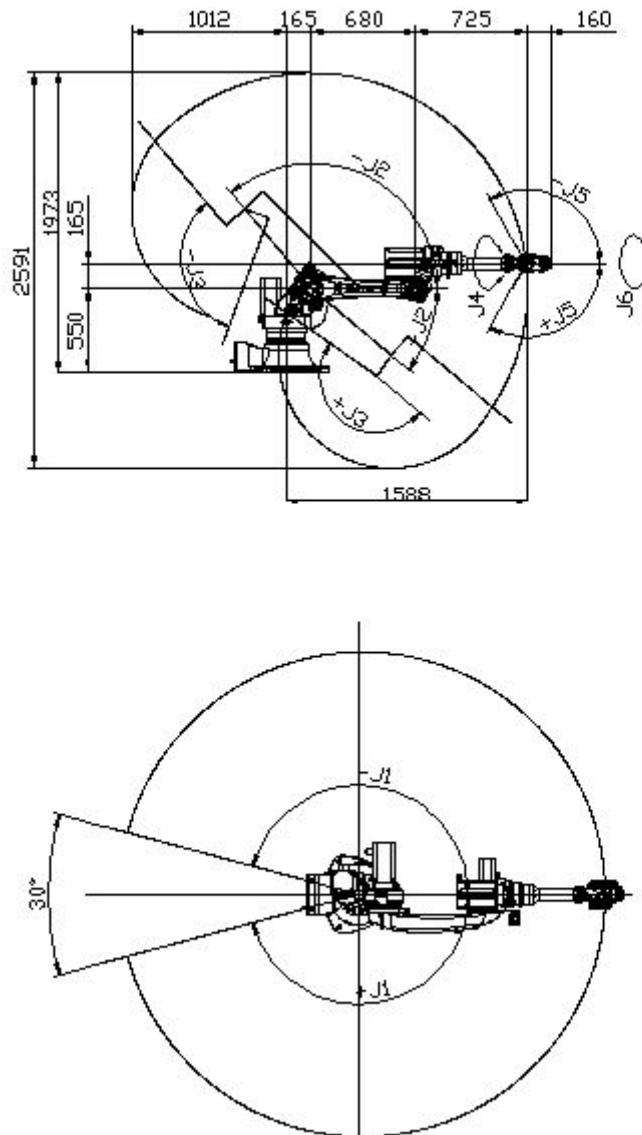


Figure 2-20 SR20 Robot's Working Space

The working space of SR18L8 robot is shown in fig.2-21. The mechanical CAD drawing can be downloaded from STEP's website: [www.steproducts.com](http://www.steproducts.com) .

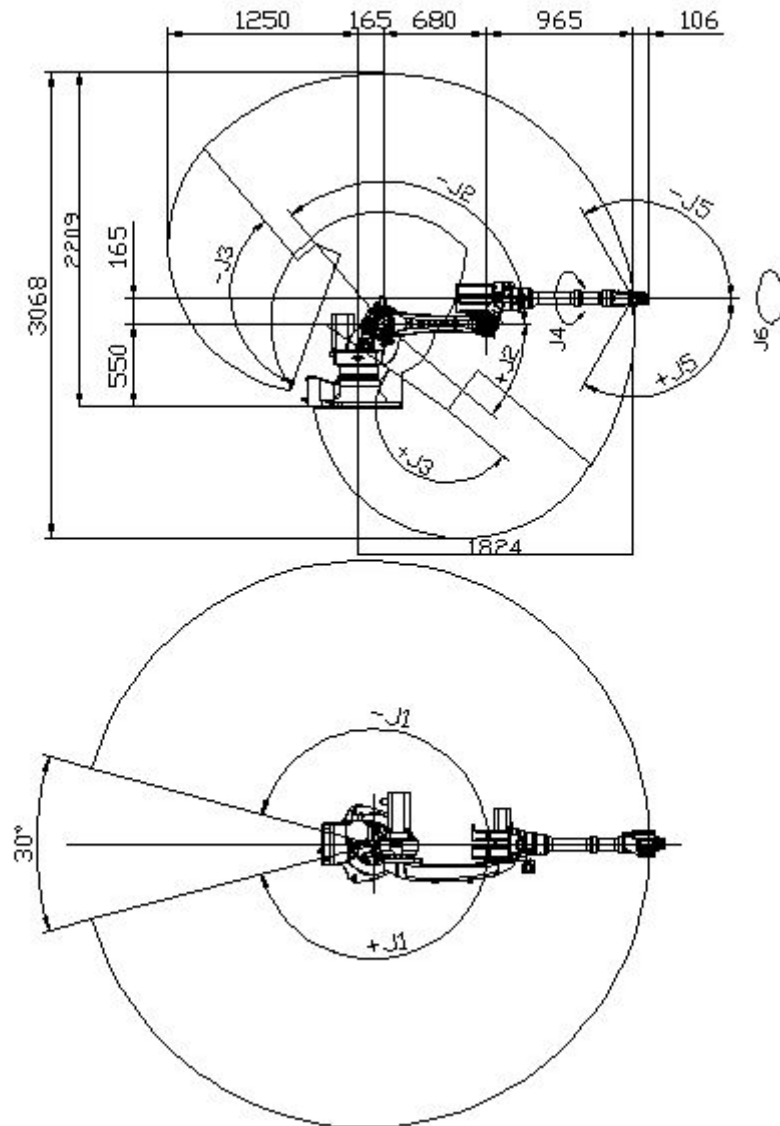


Figure 2-21 SR18L8 Robot's Working Space

The working space of SR25 robot is shown in fig.2-22. The mechanical CAD drawing can be downloaded from STEP's website: [www.steproducts.com](http://www.steproducts.com).

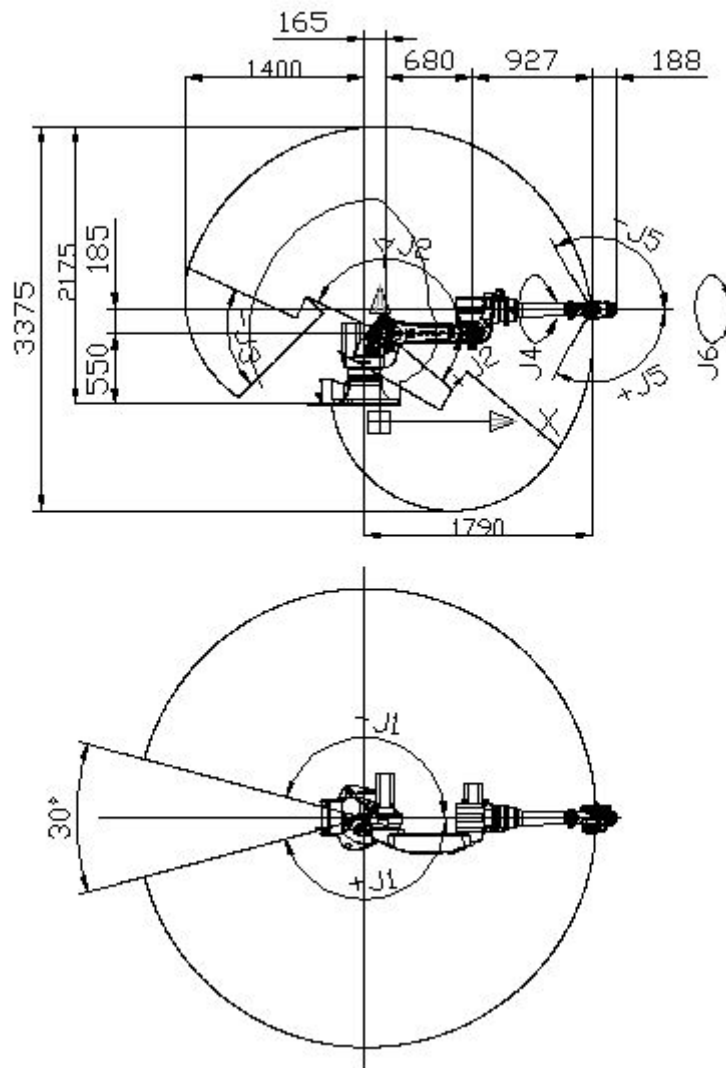


图 2-22 SR25 Robot's Working Space

The working space of SR50 robot is shown in fig.2-23. The mechanical CAD drawing can be downloaded from STEP's website: [www.steprobots.com](http://www.steprobots.com).

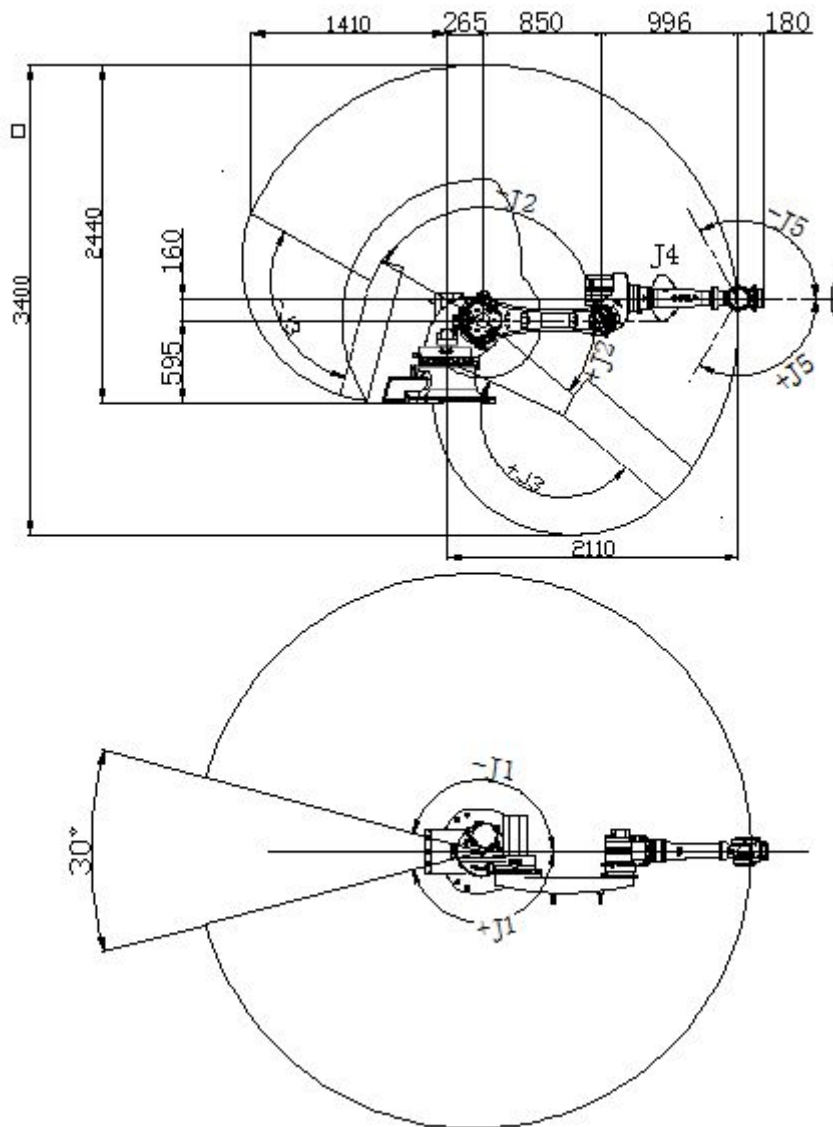


Figure 2-23 SR50 Robot's Working Space

The working space of SR165 robot is shown in fig.2-24. The mechanical CAD drawing can be downloaded from STEP's website: [www.steprobots.com](http://www.steprobots.com).

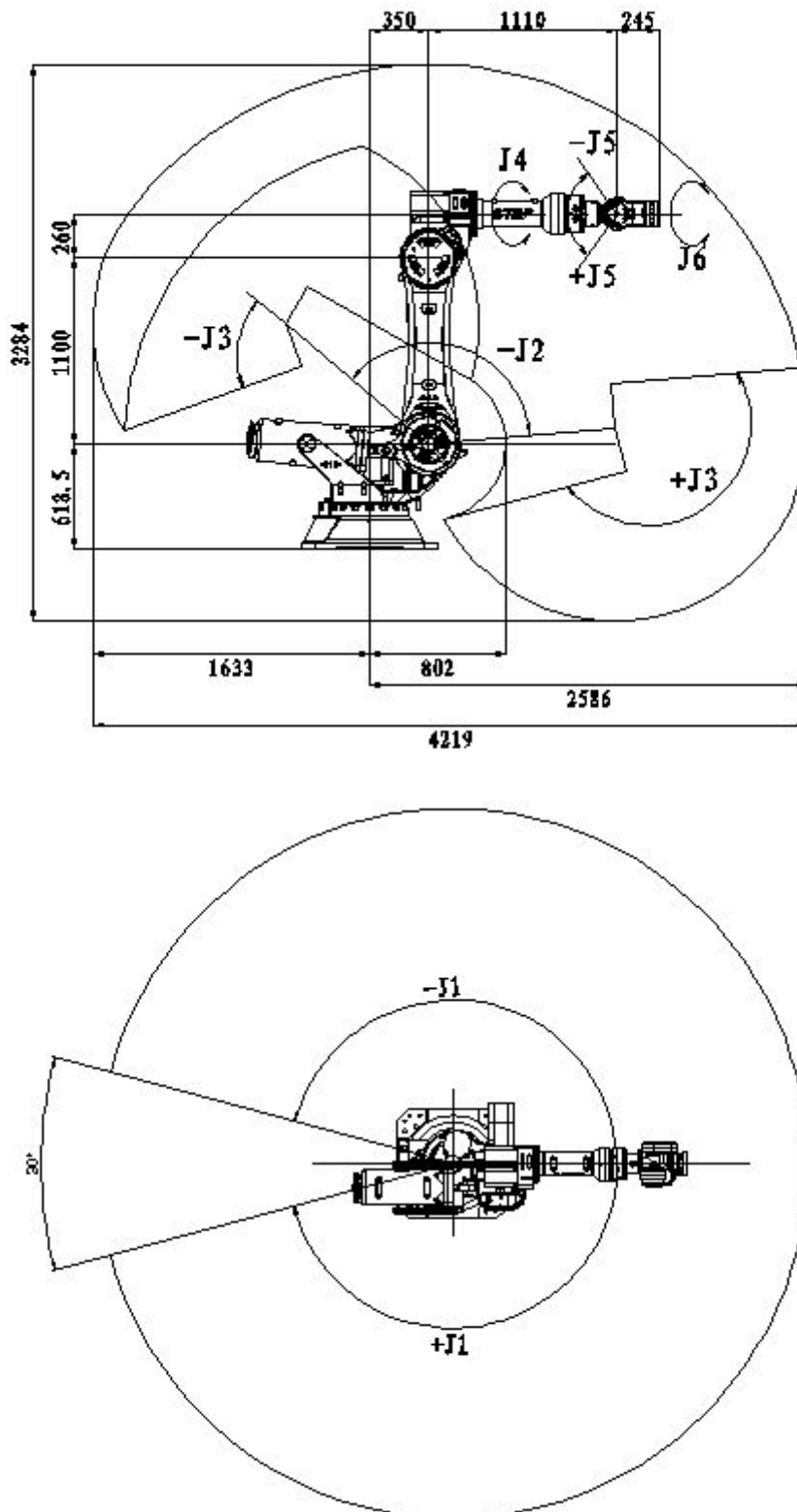
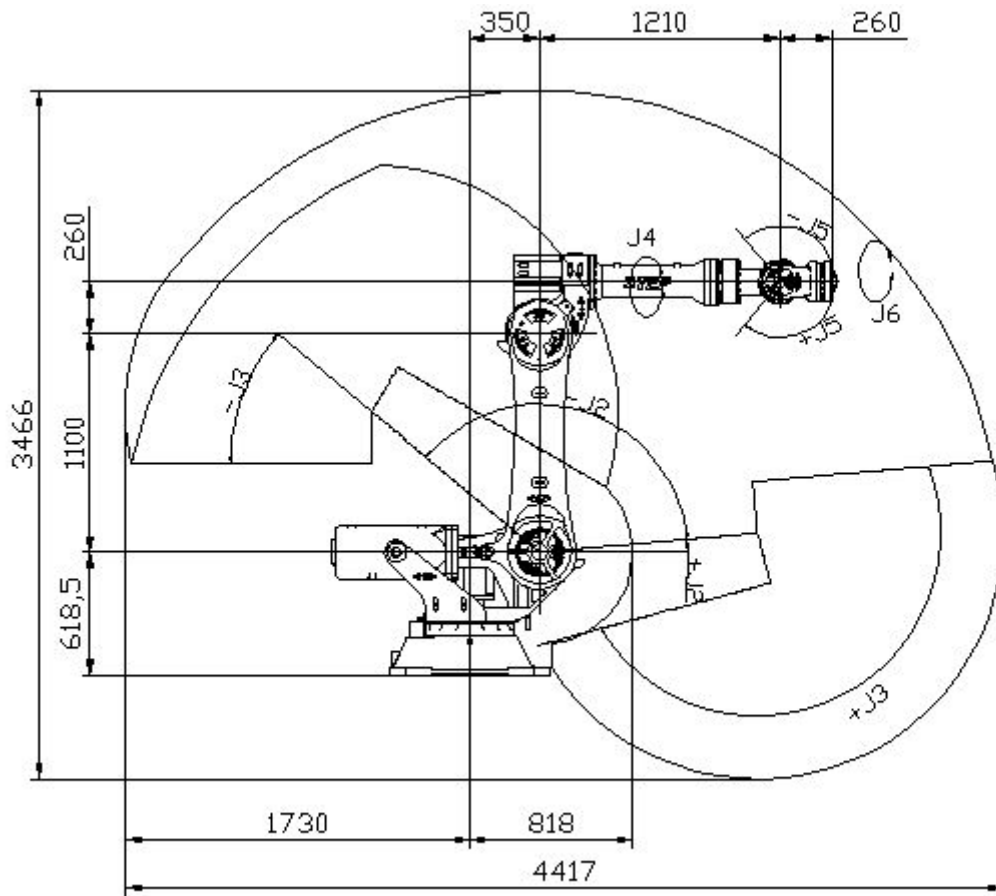


Figure 2-24 SR165 Robot's Working Space

The working space of SR210 robot is shown in fig.2-25. The mechanical CAD drawing can be downloaded from STEP's website: [www.steprobots.com](http://www.steprobots.com) .



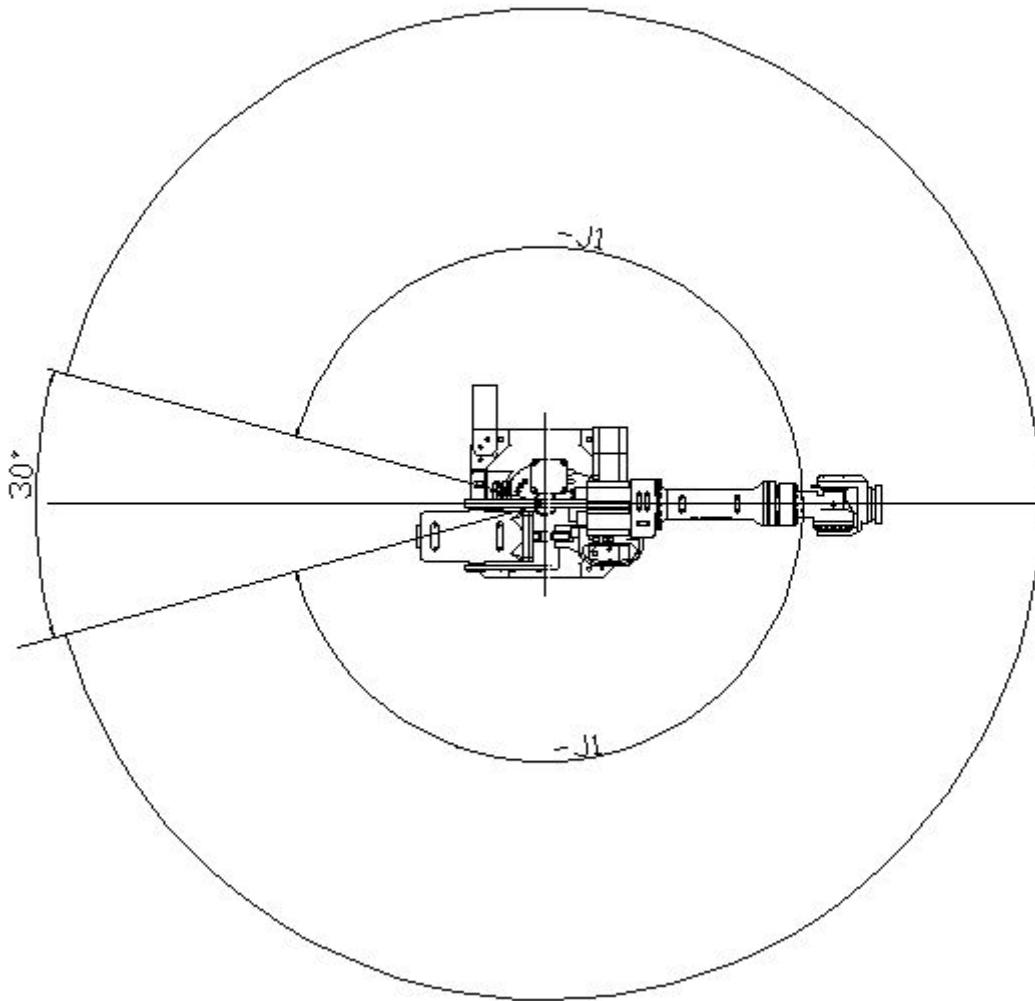


Figure 2-25 SR210 Robot's Working Space

## Chapter III Handling and Installation

### 3.1 Handling

The robot shall be moved using a fork lift. When using a fork lift to move the robot, the base of the robot shall be installed with two fork pocket tooling, which are the accessories of the robot. In each transportation, make sure that the fork pocket tooling is securely installed and the robot is adjusted to transportation posture.

The transportation posture for SR20/ SR18L8/ SR25 robots are shown in fig.3-1.

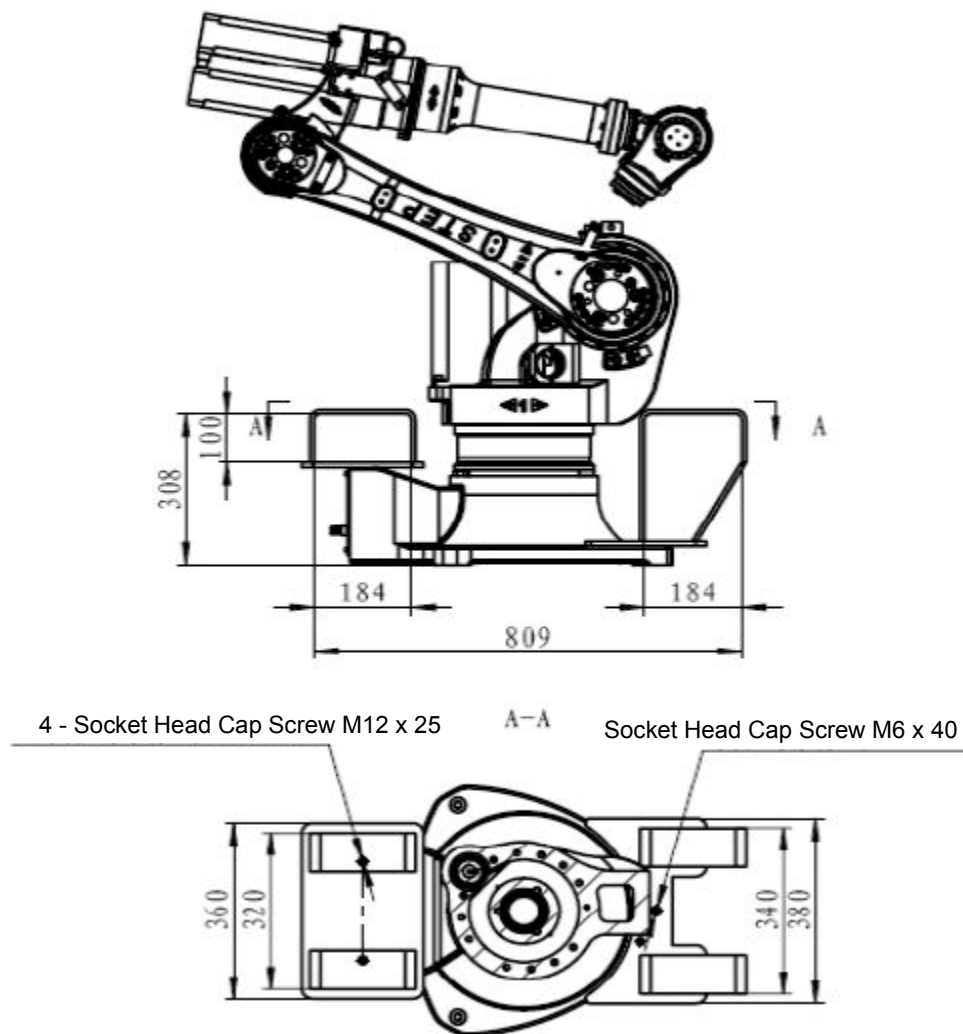


Figure 3-1 Transportation Posture for SR20/ SR18L8/ SR25 Robot

The joint angle in SR20/ SR18L8/SR25 robot transportation posture is listed in table 3-1.

Table 3-1 Joint Angle in SR20/SR18L8 Robot Transportation Posture

Joint	J1	J2	J3	J4	J5	J6
Angle	0	-155	+165	0	+120	0

The transportation posture of SR50 robot is shown in fig.3-2.

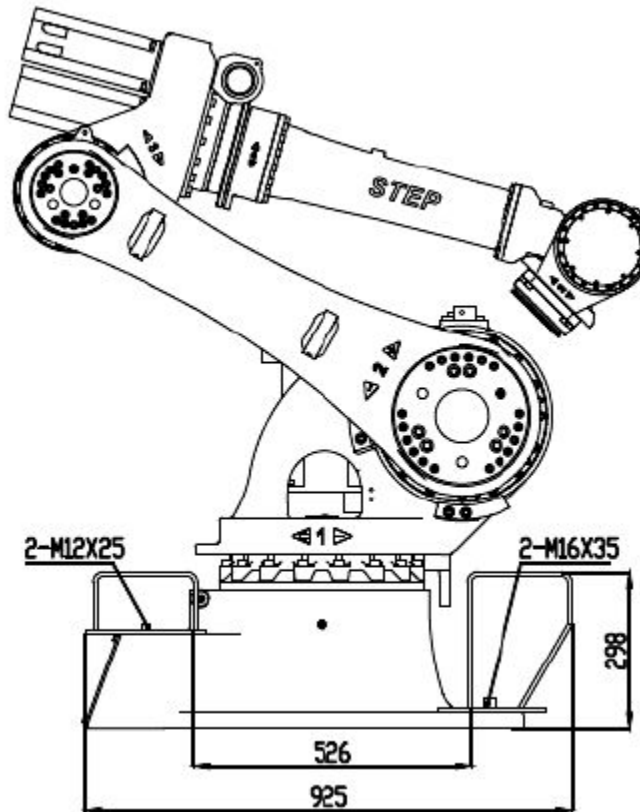


Figure 3-2 SR50 Robot Transportation Posture

The joint angle in SR50 robot transportation posture is listed in table 3-2.

Table 3-2 Joint Angle in SR50 Robot Transportation Posture

Joint	J1	J2	J3	J4	J5	J6
Angle	0	-150	+165	0	+110	0

The transportation posture of SR165/SR210 robot is shown in fig.3-3.

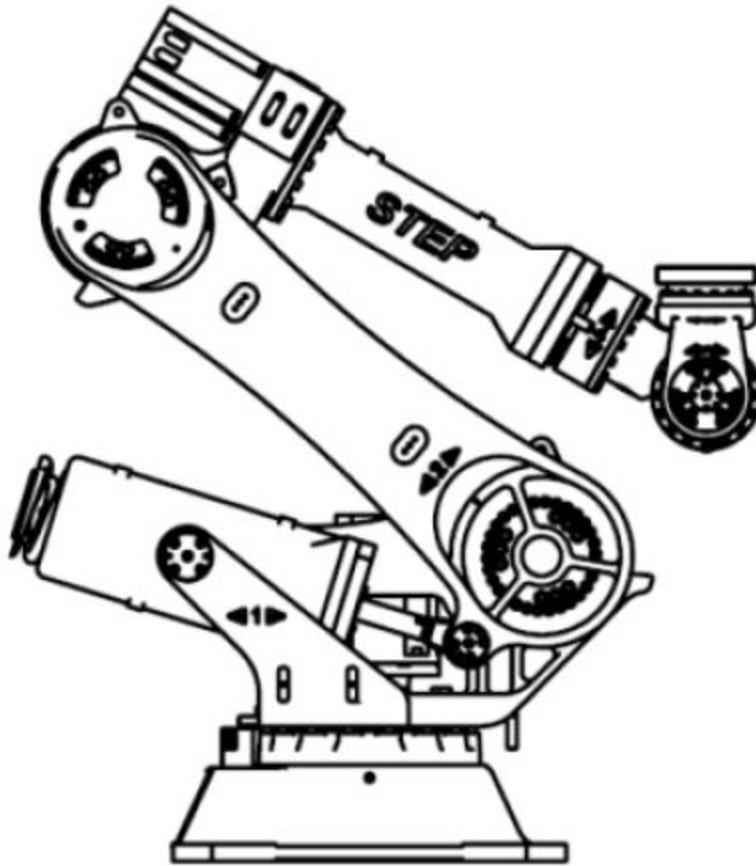


Figure 3-3 SR165/SR210 Robot Transportation Posture

The joint angle in SR165/SR210 robot transportation posture is listed in table 3-3.

Table 3-3 Joint Angle in SR165/SR210 Robot Transportation Posture

Joint	J1	J2	J3	J4	J5	J6
Angle	0	-140	+155	0	-120	0

## 3.2 Installation

There are 3 installation methods for the robot, such as ground installation, ceiling installation and wall installation.

1. The base mounting hole dimensions of SR20/ SR18L8/ SR25 robot are shown in fig.3-4.

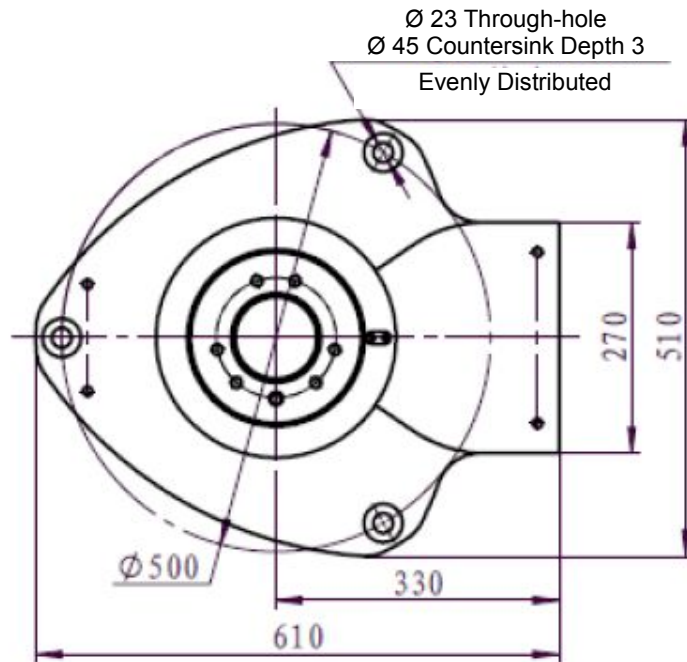


Figure 3-4 Base Mounting Hole Dimensions of SR18/SR18L8/SR25 Robot

The base mounting hole dimensions of SR50 robot are shown in fig.3-5.

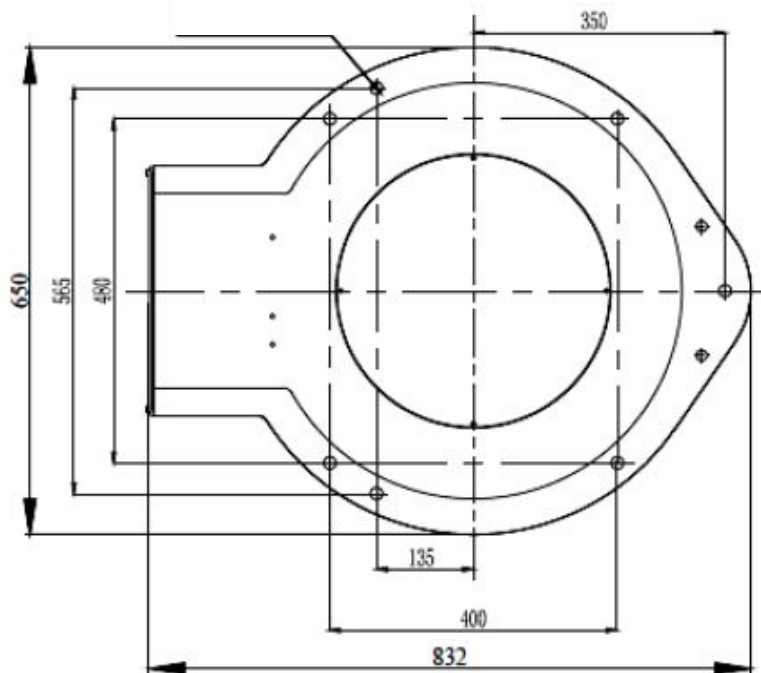


Figure 3-5 Base Mounting Hole Dimensions of SR50

The base mounting hole dimensions of SR165/ SR210 robot are shown in fig.3-6

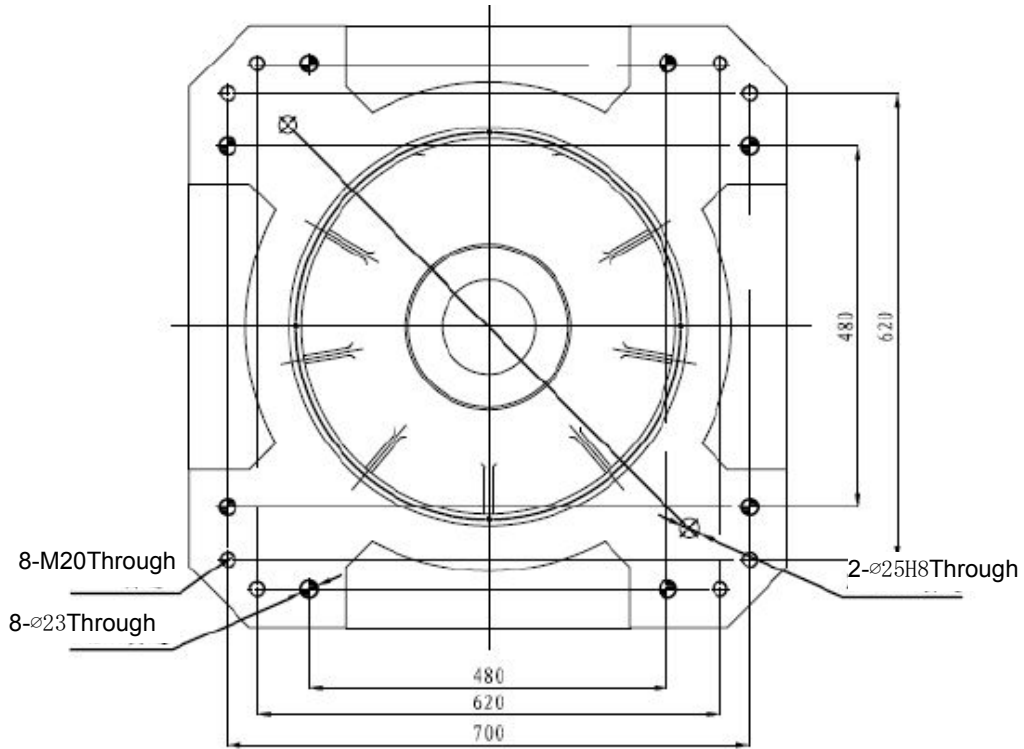


Figure 3-6 Base Mounting Hole Dimensions of SR165/ SR210

2. The upper arm auxiliary mounting hole dimensions of SR20/SR18L8 are shown in fig.3-7; The upper arm auxiliary mounting hole dimensions of SR25 is shown in fig.3-8.

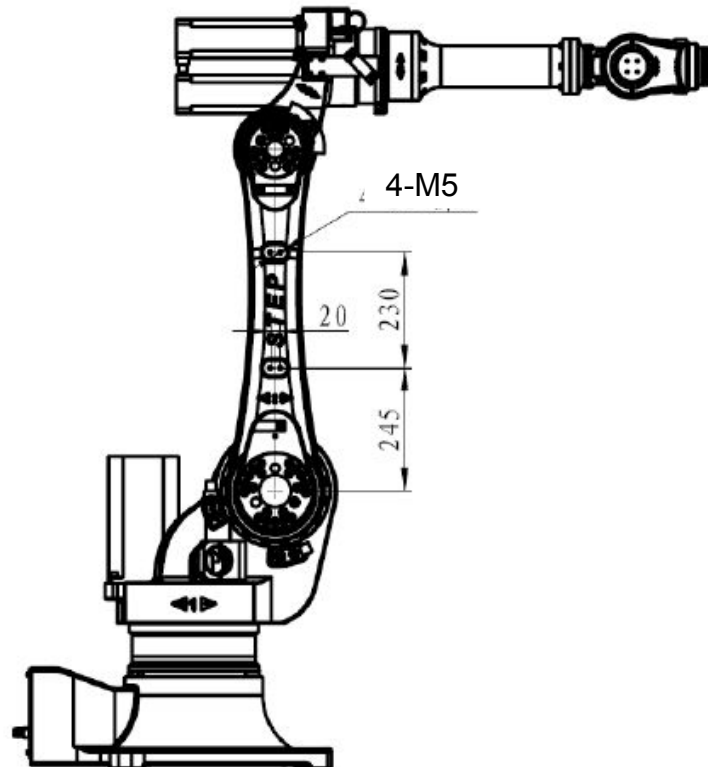


Figure 3-7 Upper Arm Auxiliary Mounting Hole Dimensions of SR18

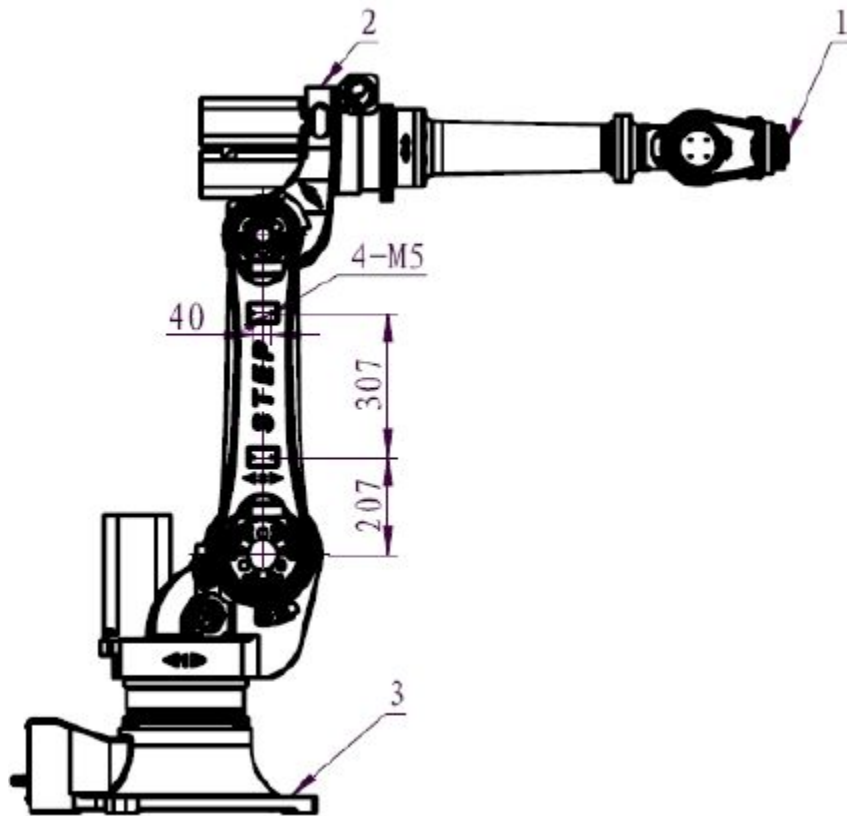


Figure 3-8 Upper Arm Auxiliary Mounting Hole Dimensions of SR25

3. The forearm auxiliary mounting hole dimensions of SR20/SR18L8 are shown in fig.3-9; The forearm auxiliary mounting hole dimensions of SR25 is shown in fig.3-10.

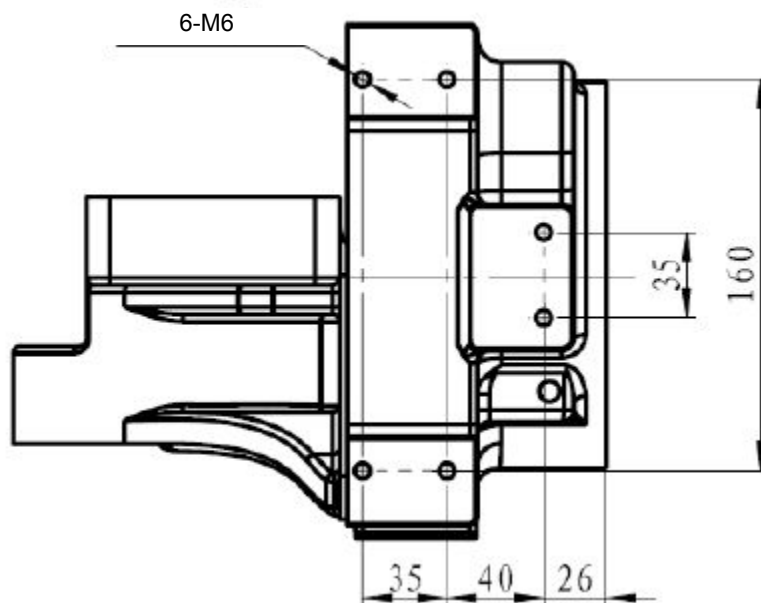


Figure 3-9 Forearm Auxiliary Mounting Hole Dimensions of SR20/ SR18L8

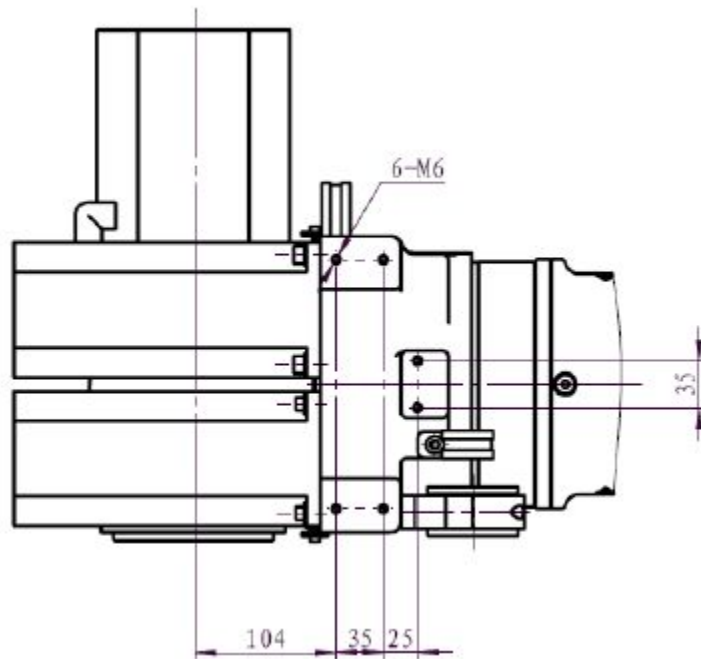


Figure 3-10 Forearm Auxiliary Mounting Hole Dimensions of SR25

The forearm auxiliary mounting hole dimensions of SR50 are shown in fig.3-11; The forearm auxiliary mounting hole dimensions of SR165 is shown in fig.3-12;The forearm auxiliary mounting hole dimensions of SR210 is shown in fig.3-13.

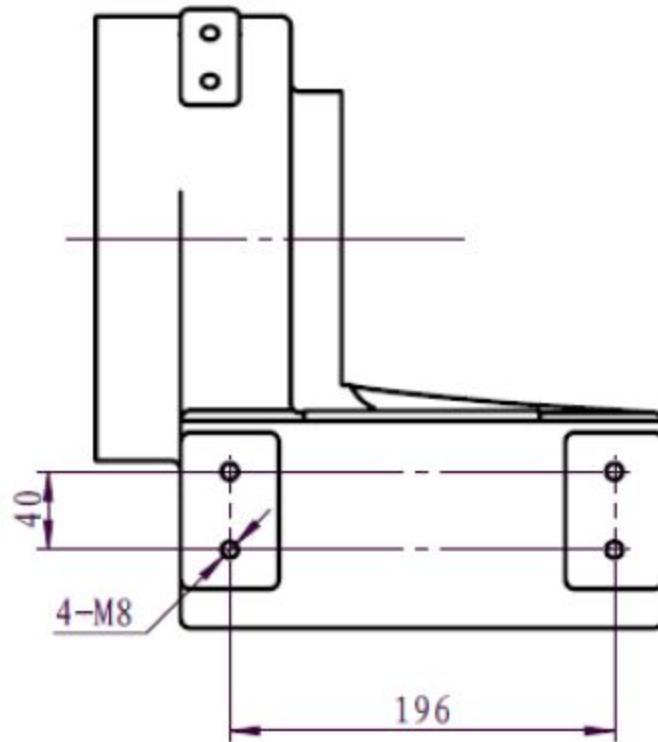


Figure 3-11 Forearm Auxiliary Mounting Hole Dimensions of SR50

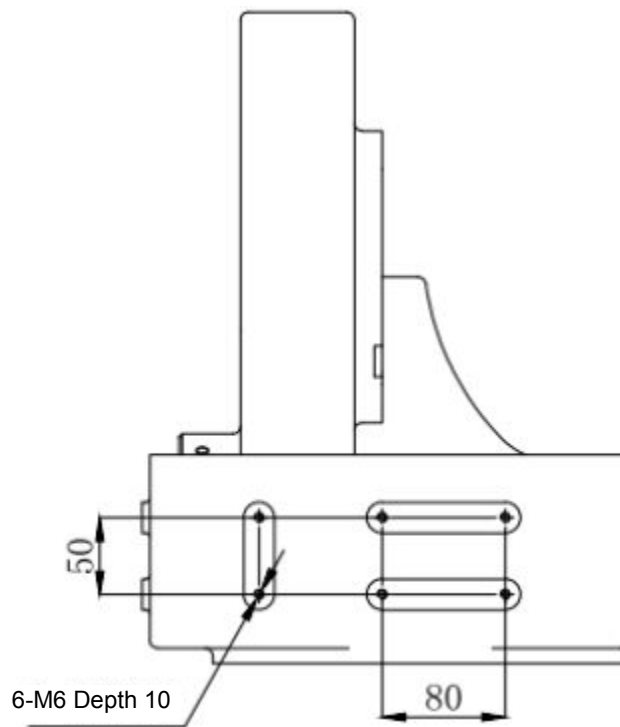


Figure 3-12 Forearm Auxiliary Mounting Hole Dimensions of SR165

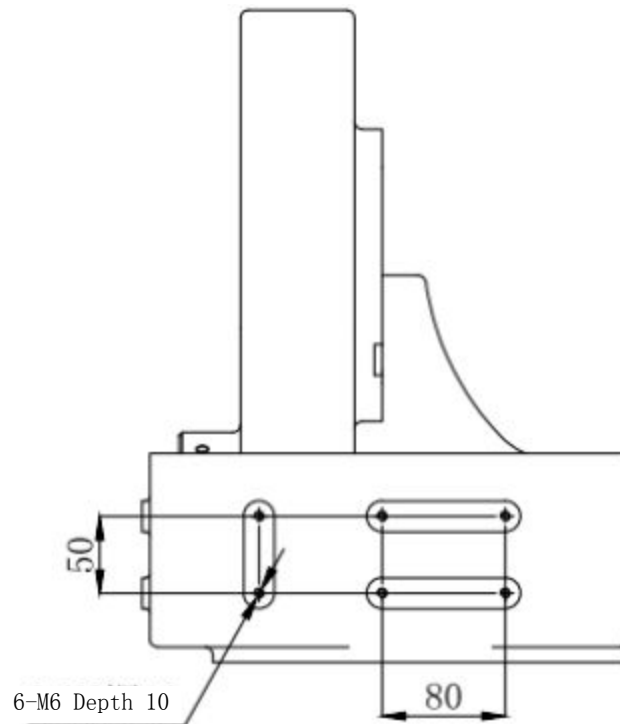


Figure 3-13 Forearm Auxiliary Mounting Hole Dimensions of SR210

4. SR20 tool flange installation dimensions are shown in fig.3-14; SR18L8 tool flange installation dimensions are shown in fig.3-15; SR25 tool flange installation dimensions are shown in fig.3-16.

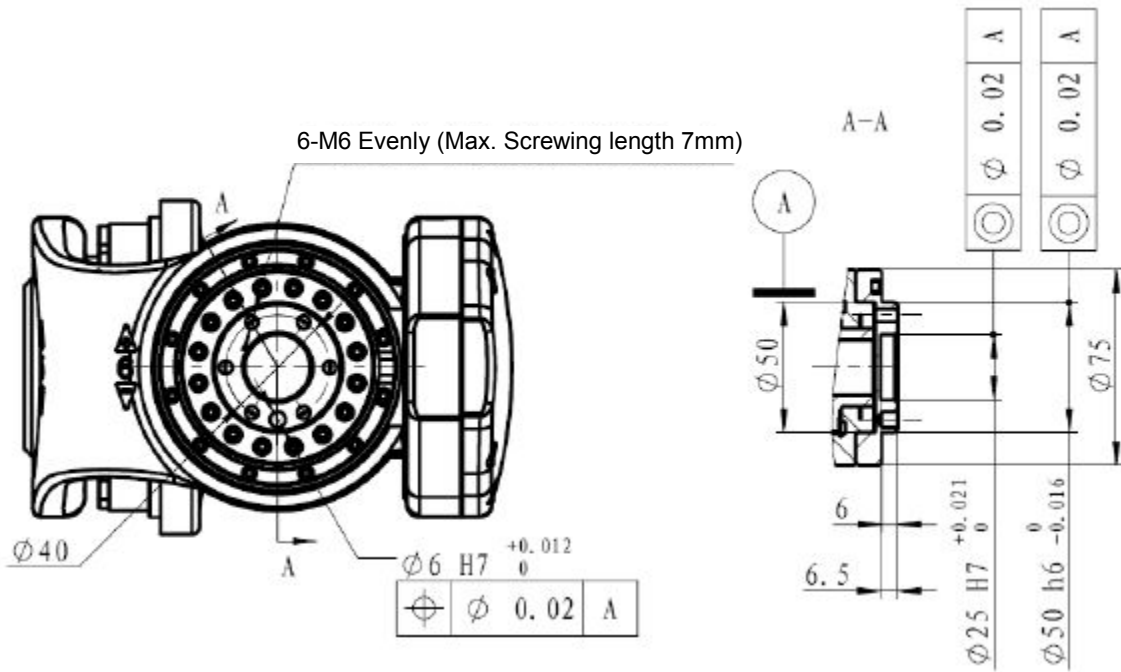


Figure 3-14 SR20 Tool Flange Installation Dimensions

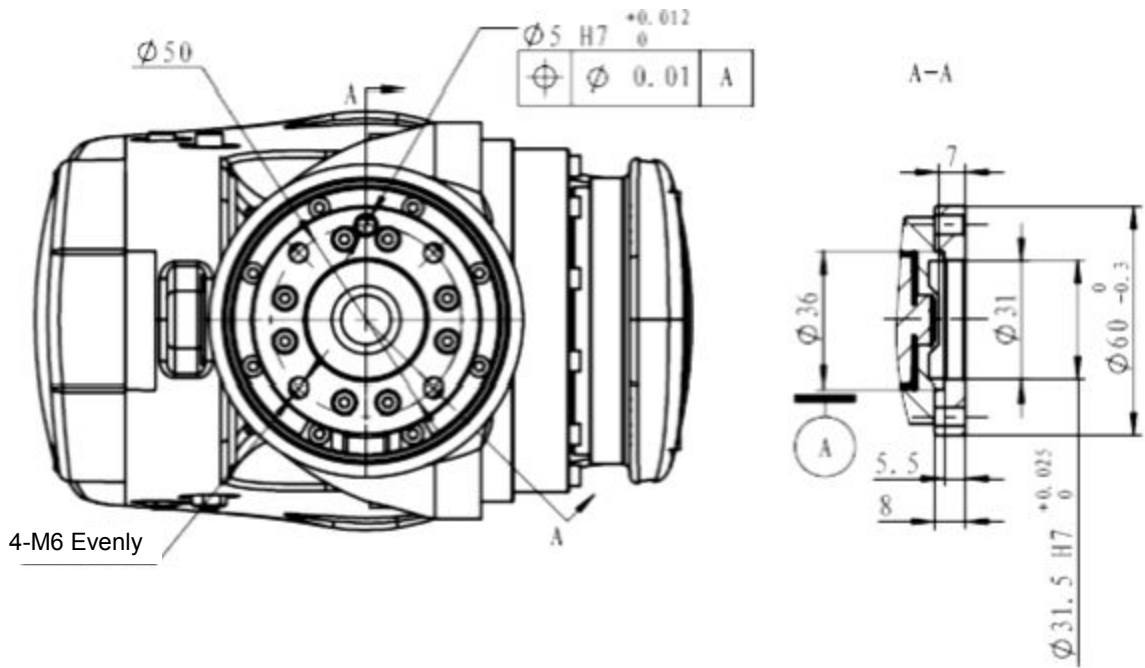


Figure 3-15 SR18L8 Tool Flange Installation Dimensions

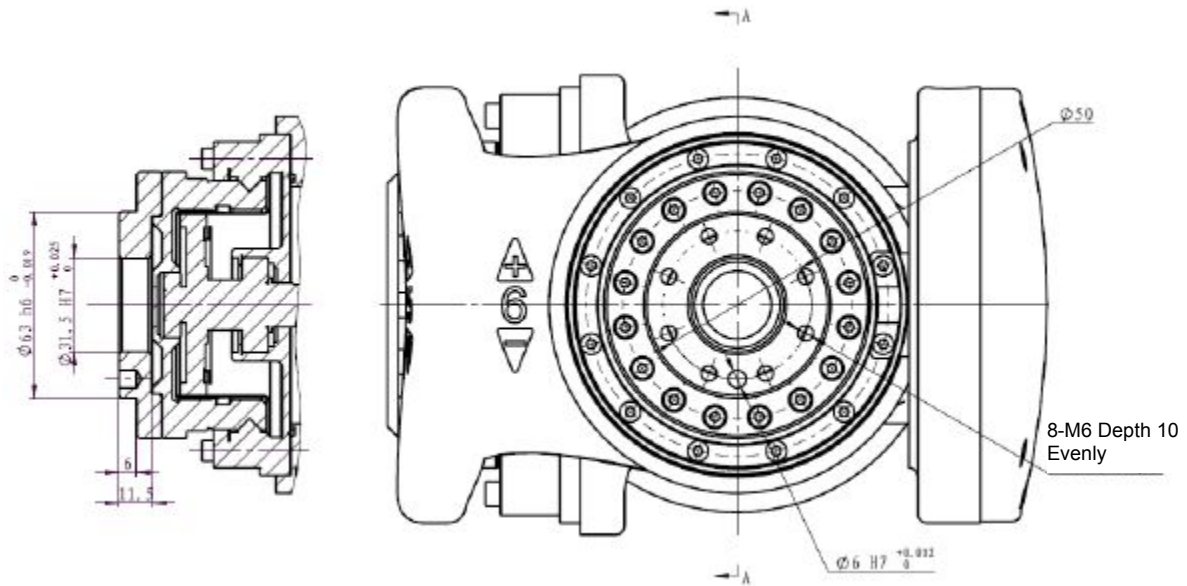


Figure 3-16 SR25 Tool Flange Installation Dimensions

SR50 tool flange installation dimensions are shown in fig.3-17; SR165 tool flange installation dimensions are shown in fig.3-18; SR210 tool flange installation dimensions are shown in fig.3-19.

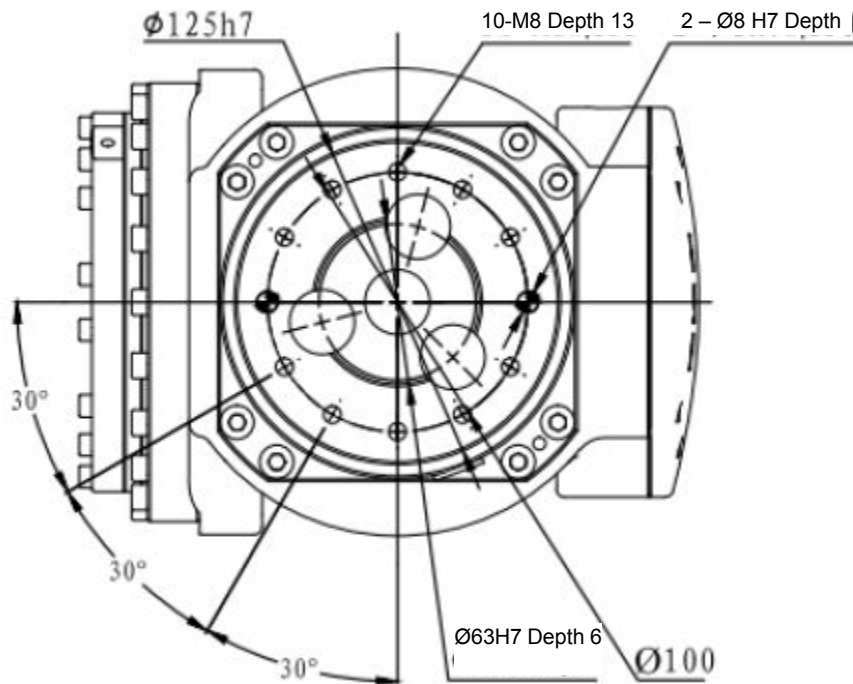


Figure 3-17 SR50 Tool Flange Installation Dimensions

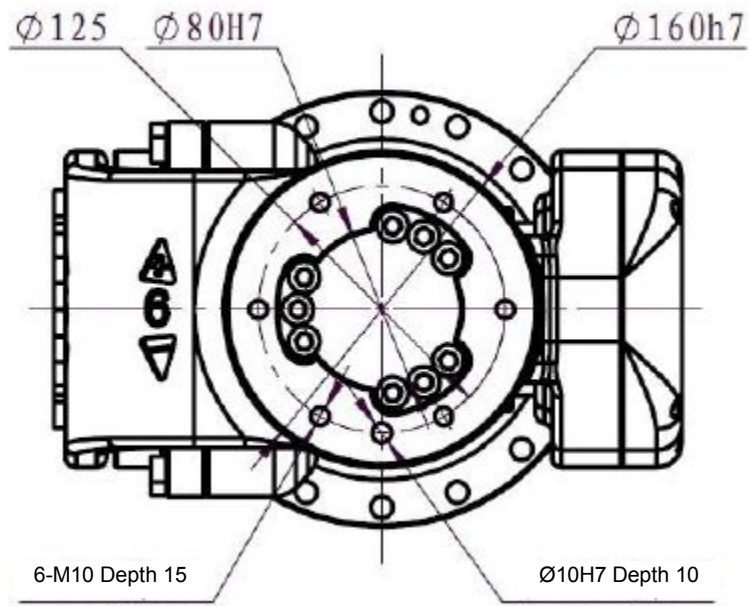


Figure 3-18 SR165 Tool Flange Installation Dimensions

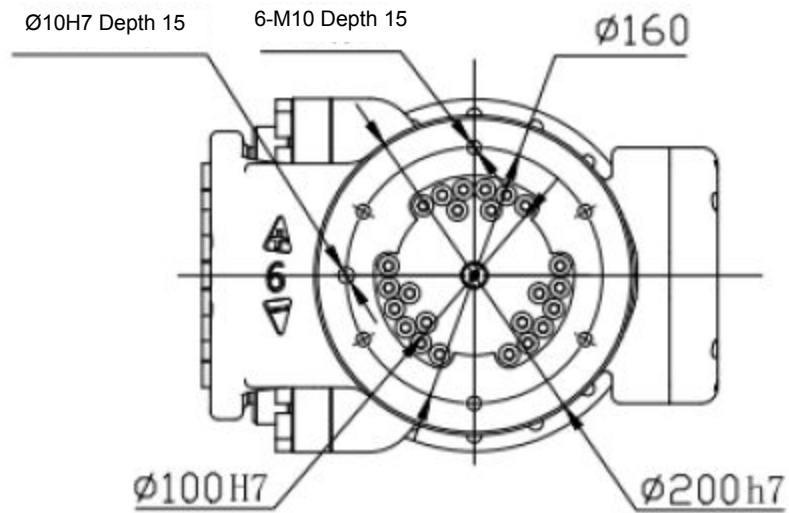


Figure 3-19 SR210 Tool Flange Installation Dimensions

# Chapter IV Maintenance

## 4.1 Lubrication

In order to maximize the robot's performance, VIGOGREASE RE0 grease is used in oil pocket based on the brand of the reduction box of SR series robot. The use of or mixed use with other grease shall be avoided. The grease used for each robot is listed in the following table.

Robot model	Grease	Remarks
SR20	VIGOGREASE RE0 grease is used in J1~J6 oil pocket	Maintenance-free for J5, J6 reduction box
SR18L8	VIGOGREASE RE0 grease is used in J1~J6 oil pocket	Maintenance-free for J5, J6 reduction box
SR25	VIGOGREASE RE0 grease is used in J1~J6 oil pocket	Maintenance-free for J5, J6 reduction box
SR50	VIGOGREASE RE0 grease is used in J1~J6 oil pocket	
SR165	VIGOGREASE RE0 grease is used in J1~J6 oil pocket	
SR210	VIGOGREASE RE0 grease is used in J1~J6 oil pocket	

### 4.1.2 Filling and drainage hole in each joint

The filling and drainage hole in each axis of SR20 is shown in fig.4-1; The filling and drainage hole in each axis of SR18L8 is shown in fig.4-2; The filling and drainage hole in each axis of SR25 is shown in fig.4-3.

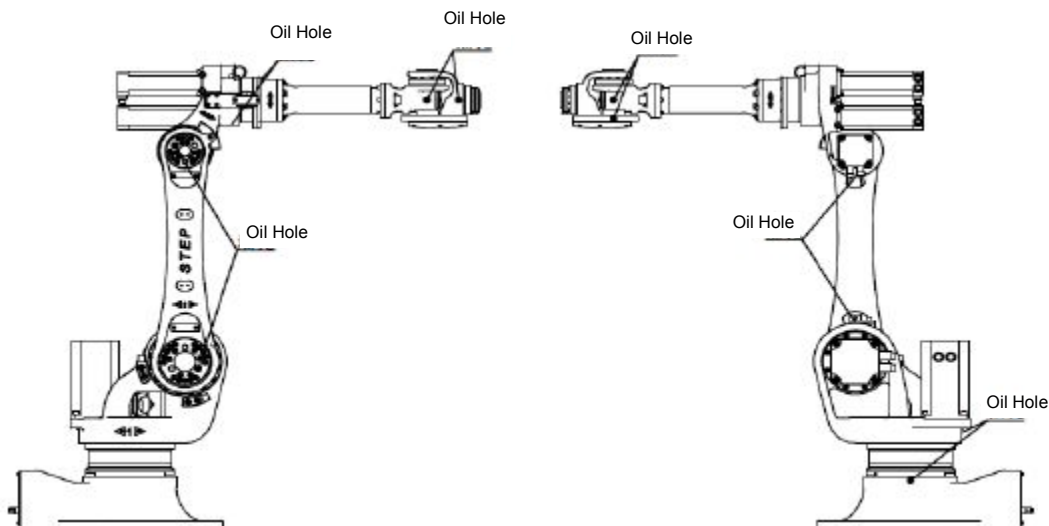


Figure 4-1 Filling and Drainage Hole in Each Axis of SR18

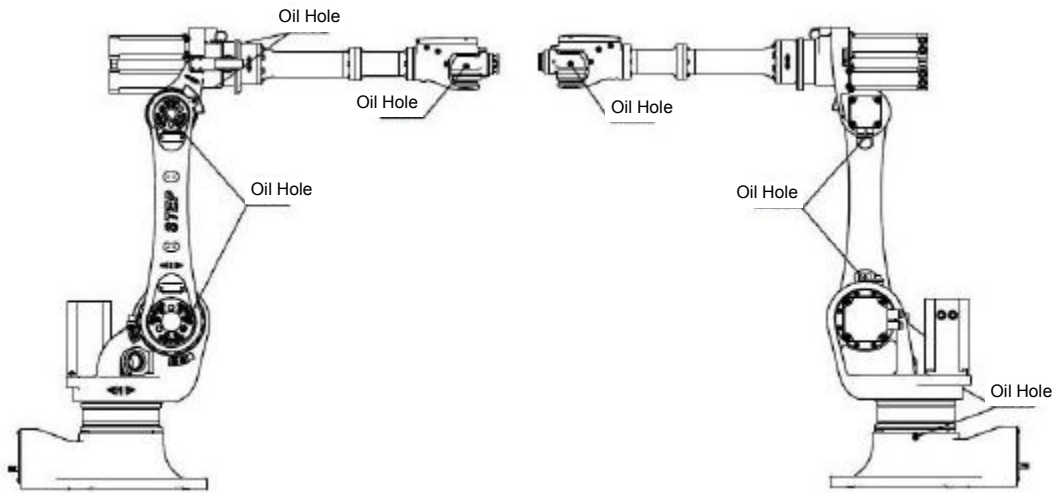


Figure 4-2 Filing and Drainage Hole in Each Axis of SR18L8

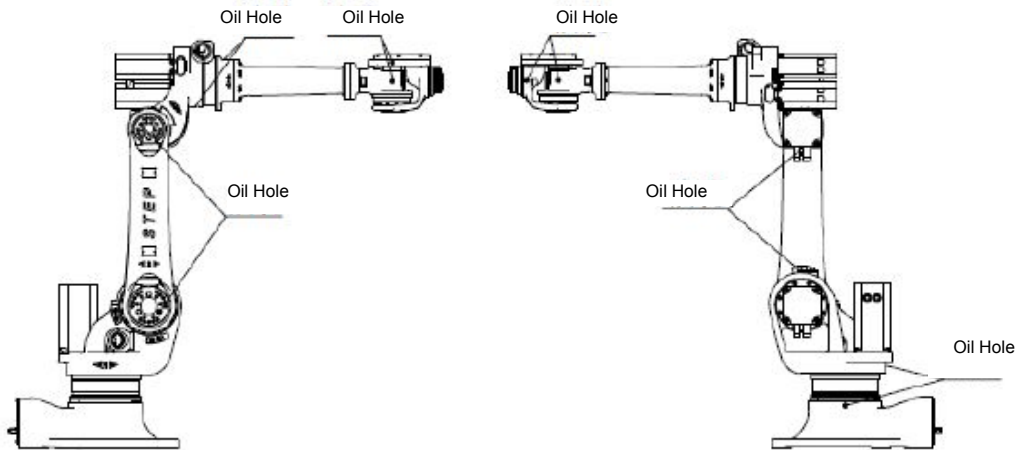


Figure 4-3 Filing and Drainage Hole in Each Axis of SR25

The filling and drainage hole in each axis of SR50 is shown in fig.4-4; The filling and drainage hole in each axis of SR165 is shown in fig.4-5; The filling and drainage hole in each axis of SR210 is shown in fig.4-6.

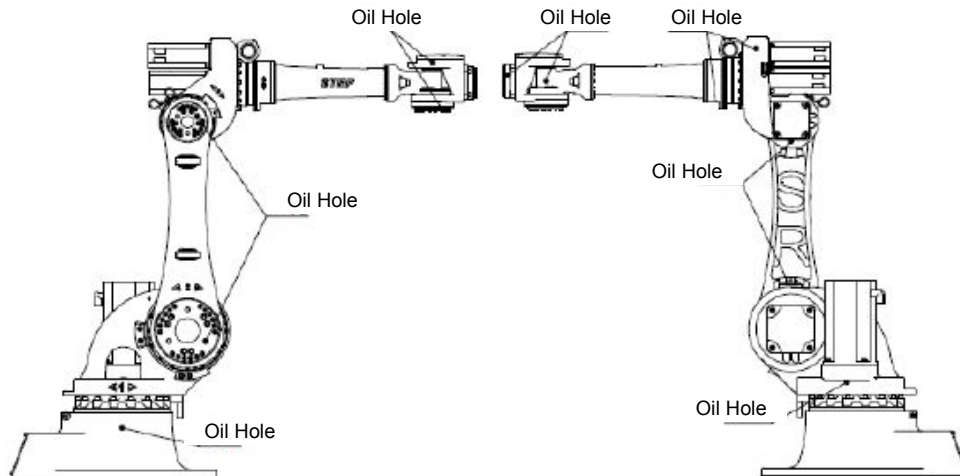


Figure 4-4 Filing and Drainage Hole in Each Axis of SR50

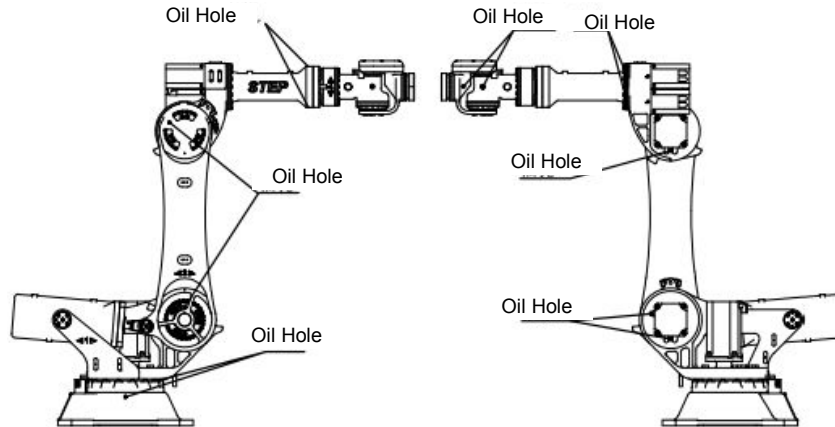


Figure 4-5 Filing and Drainage Hole in Each Axis of SR165

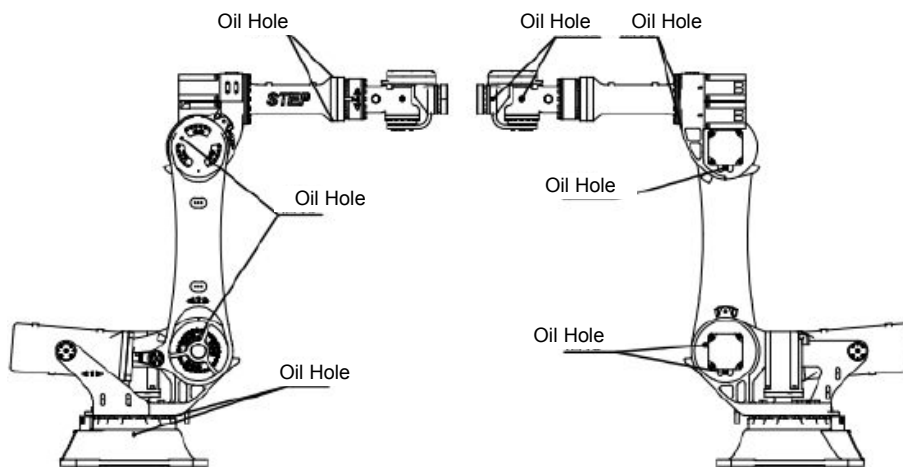


Figure 4-6 Filing and Drainage Hole in Each Axis of SR210

The SR robots with balance cylinder is provided with lubrication point at connecting pin. It requires lubrication every half year. The filling is deemed sufficient when the black matters are squeezed out completely. See the part indicated in fig.4-7 as an example.

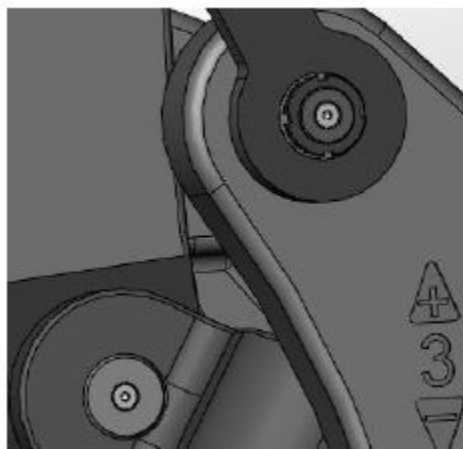


Figure 4-7 Oil Hole Location at Connecting Pin

The filling and drainage holes in each axis are determined based on the installation method. In the grease replacement at each axis, the higher oil hole is chosen as grease drainage hole and the lower hole as filling hole.

### 4.1.3 Lubricant replacement

1. Each axis is filled with grease before delivery. The grease gun is used for replacement.
2. According to the aging condition of the grease, the grease shall be replaced after 20,000 hours since delivery. However, when the surface temperature of the reduction box reaches above 40 °C, you shall check the aging and contamination condition of the grease and shorten the replacement cycle.
3. The grease filled shall reach around 90% of the oil pocket. Consult STEP's after sales service staff for specifics.

## 4.2 Timing belt

The proper use of the timing belt not only ensures smooth production and transmission, but also reduces the failure rate of the equipment and increase the life cycle of the belt.

### 4.2.1 Model of the timing belt in the robot

The timing belt is used in forearm drive cylinder and wrist joint transmission for part of the SR series robots. In the forearm drive cylinder, the timing belt is used for J5, J6 motor and J5, J6 drive rod transmission. High precision imported brand shall be used for these belts. If replacement is needed, contact STEP's after sales service staff.

### 4.2.2 Notice for use

1. Bending is forbidden, so as to avoid causing any damage to the skeleton material and affecting the belt strength.
2. It is forbidden to deal any cut on the belt to avoid premature failure of the belt.
3. Avoid contact with chemicals (in particular strong oxidizing acid, such as concentrated sulphuric acid)
4. Avoid long-term exposure to oil and water.
5. As the tension of the timing belt changes with time, the operator shall adjust the tension regularly, check the operation of the timing belt and its pulley and perform adjustment and replacement as needed. The inspection and maintenance cycle is recommended as around 1 month.

### 4.2.3 Notes for belt replacement

1. You shall inform STEP technicians before the replacement of the timing belt. The replacement cannot be performed until written permission from STEP is obtained. Otherwise, our company is not responsible for any damage or downtime possibly caused by the replacement.
2. In the selection of the timing belt, the belt shall have clean surface, with no deformation and full teeth.
3. During replacement, the timing belt can only be removed when the tension is reduced to the lowest point. It is forbidden to pry off the belt using non-dedicated tool with high tension on the belt.
4. In replacement, if the center-to-center distance of two pulleys can be moved. You shall decrease the center-to-center distance and reset it when the timing belt is installed. If there is tension pulley, loose the pulley, install the belt and re-install the pulley.
5. The pre-tensioning force shall be adjusted in installation. If the pre-tensioning force is not sufficient, the transmission capability will be reduced greatly and the pulley's temperature will rise sharply and cause wear. In turn, if the pre-tensioning force is too strong, the service life of the belt will be decreased. In conclusion, proper pre-tensioning force is key to normal timing belt operation.
6. After the replacement, return-to-zero process shall be done by professional technician for the robot before it can be used normally. Otherwise, the zero point of the robot will be lost, which will cause danger.