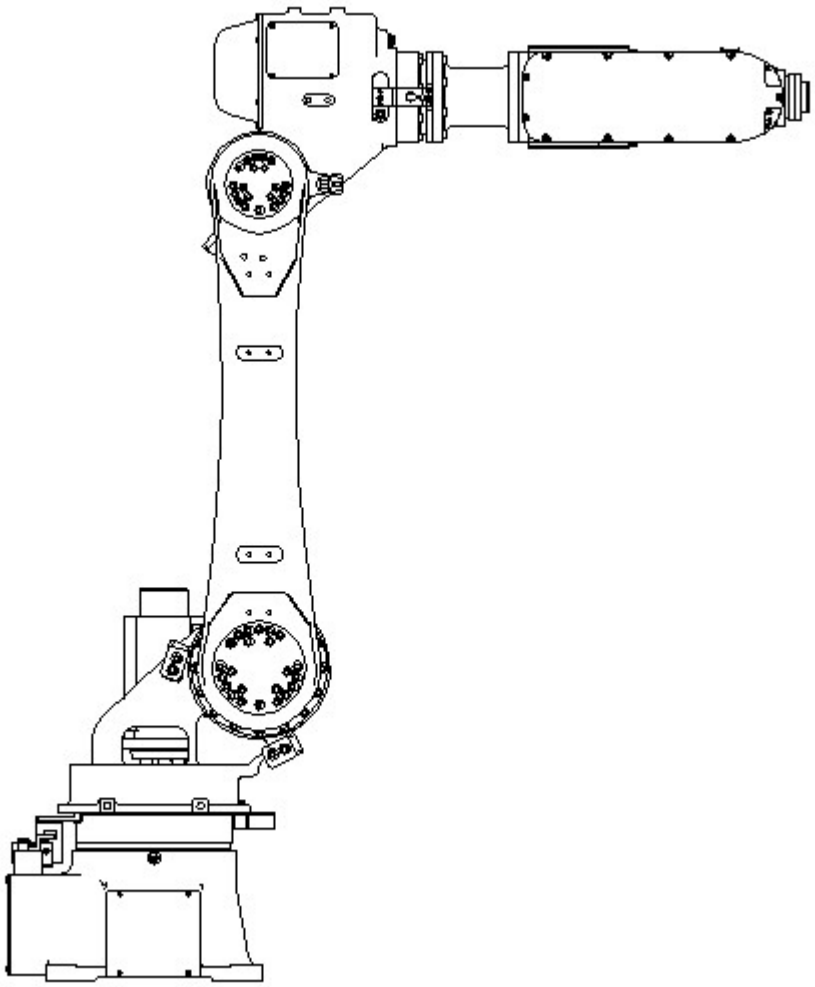
The Robot Maintenance Operation Manual



RobotAnno(Shenzhen)Co.,Ltd.

目 录

1、Safety

1.1 Robotic Arm Using Terms and Conditions

This manual includes safety precautions for protecting the user and preventing damage to the machine. Users need to learn all the relevant descriptions and fully understand the safety precautions. In this manual, we try to describe all the various situation as much as possible. However, we cannot describe all the matters, which must not be done or which cannot be done, because there are so many possibilities.

The following basic information needs to be understood and followed when using the robot or robot system for the first time.

This indicates an imminently hazardous situation which, if not avoided, could result in injury or major damage to the equipment.

This indicates a potentially hazardous situation which, if not avoided, could result in injury or major damage to the equipment.

This indicates a potentially situation which, if not avoided, could result in injury or major damage to the equipment. Marked with this symbol, depending on the circumstances, sometimes may have significant consequences.

1.1.1 Safety precautions during adjustment, operation, and maintenance

1） Operator must wear work clothes, hard hats, safety shoes, etc.

2） A line should be drawed to mark the range of motion of the robot to let the operator knows the robot’s, including the holding tools, (like mechanical hand or tools) operating range

3） Ensure there are no workers in the robot's operating range when turning on the power.

4） The power must be cut off before entering the robot's operating range for work.

5） Sometimes, inspection, maintenance and other operations must be carried out under power.

At this time, two people should work in groups. One person keeps the position where the emergency stop button can be pressed immediately, and the other person stays alert and works quickly within the robot's movement range. In addition, you should confirm the retreat path before proceeding.

6） The load on the joint and the mechanical arm must be controlled within the allowable weight. If you do not follow the regulations that allow the weight to be transported, it will cause abnormal movements or mechanical components to be damaged in advance.

7） Please carefully read the Operation manual in the "Safety" chapter of the operating instructions "Robot Operation Instructions".

8） It is forbidden to disassemble and operate the parts not covered by the maintenance manual.

The robot is equipped with various self-diagnosis functions and abnormality detection functions, and it can be safely stopped even if an abnormality occurs. Even so, accidents caused by robots still occur from time to time.

Robot accidents are mostly in the following situations:

1. The automatic operation was executed without confirming whether there is a person in the robot's movement range.

2. In the automatic operation state, the worker enters the motion range of the robot, and the robot suddenly starts during the operation.

3. Only pay attention to the robot in front of you, not to other robots.

The above-mentioned accidents were caused by the same reasons of "neglecting the safe operation steps" , "unexpectedly the robot will suddenly move". In other words, accidents are caused by human unsafe behaviors such as "temporary negligence" , "failure to follow prescribed steps".

The "emergency situation" makes it too late for operators to carry out "emergency stop", "escape" and other actions to avoid accidents, which is very likely to cause major accidents.

"Emergency situations" generally have the following types.

1） The low-speed action suddenly becomes a high-speed action.

2） Other operators performed the operation.

3） A different program was started due to an abnormality or a program error in peripheral equipment.

4） Abnormal operation due to noise, faults, defects, etc.

5） Misoperation.

6） The original high-speed operation was performed at a low-speed regeneration.

7） The workpieces transported by the robot fall and fall apart.

8） When the workpiece is in a stopped state of being clamped or on standby, it suddenly loses control.

9） The robot next to or behind performed the action.

The above are just some examples, and there are many forms of "emergency". In most cases, it is impossible to "stop" or "escape" the robot with sudden movements, so the following best countermeasures should be performed to avoid such accidents

Be careful, don't approach the robot.

Measures such as ″pressing the emergency stop button″ and ″cutting off the power″ should be taken to prevent the robot from moving, when not using the robot

Please configure a monitoring person (third party) who can immediately press the emergency stop button to monitor the safety situation during the operation of the robot,

The emergency stop button could be pressed immediately during the operation of the robot.

In order to abide by these principles, you must fully understand the precautions described below and follow them effectively.

1.1.2 Safety countermeasures of robot body

The design of the robot should remove unnecessary protrusions or sharp parts, use materials suitable for the operating environment, and adopt a fail-safe protective structure that is not prone to damage or accidents during operation.

In addition, it should be equipped with a malfunction detection stop function and an emergency stop function when the robot is used, and an interlock function to prevent the danger of the robot when an abnormality occurs in the peripheral equipment to ensure safe operation.

The robot body is a multi-joint mechanical arm structure, and the angle of each joint in motion is constantly changing.

When performing operations such as teaching and approach the robot, be careful not to get caught in the joints.Each joint has the mechanical stop, but it is very dangerous to be caught, so it needs special attention.

In addition, if the motor is removed or the brake is released, the robot arm may fall due to its own weight or move in an unstable direction.

Therefore, it is necessary to implement measures to prevent falling, and confirm the surrounding safety situation before proceeding.

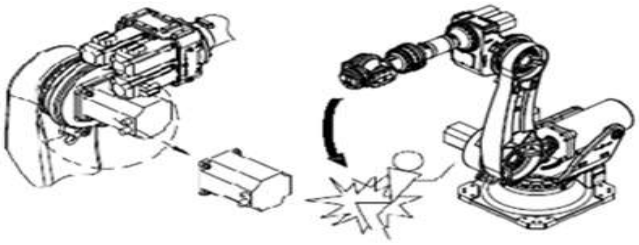
Remove the motor without fixing the robot arm. The robot arm may fall or move back and forth. Please fix the arm first, then remove the motor.

Remove the motor without fixing the robot arm. The robot arm may fall or move back and forth.

After inserting the zero point bolt, use a wooden block or a crane to fix the robot arm to prevent it from falling, and then remove

注意

the motor (the zero point bolt and the stopper are used to align the original position, and can not be used to fix the robot arm.)



In addition, do not remove the motor with the robot arm supported by human hands.

注意

In the normal state, the balance spring device is in a compressed state, and the danger is extremely high. Disassembly or decomposition is strictly prohibited

注意

When installing the attached machine on the end effector and the robot arm, strictly observe the size and number of bolts specified in this book, and use a torque wrench to tighten at the specified torque.

In addition, do not use rusty or dirty bolts.

Unscheduled tightening and imperfect methods will loosen the bolts and cause major accidents

注意

When designing and manufacturing an end effector, control within the allowable load range of the robot wrist.

注意

It need to adopt a fail-safe protective structure should . Even if the power supply of the end effector or the supply of compressed air is cut off, the accident of releasing or flying out of the gripping objects will not occur, and the corners or protrusions will be treated to prevent the Cause damage to things.

注意

It is strictly forbidden to supply power, compressed air, and welding cooling water outside the specification, which will affect the performance of the robot and cause dangerous situations such as abnormal movements or malfunctions or damage.

注意

Although electromagnetic wave interference is related to its type or intensity, there is no perfect countermeasure with current technology. In the operation of the robot and in the case of power-on, etc., the operation precautions should be observed. Due to electromagnetic waves, other noises, and substrate defects, the recorded data will be lost.

Therefore, please back up the program or constants to an external storage medium such as a compact flash card.

注意

In a large-scale system, multiple operators perform the work, and when they have to talk far away, they should communicate their intentions correctly by using gestures.

Factors such as noise in the environment can prevent the meaning from being conveyed correctly and cause an accident.

Industrial robot gesture method (example)

注意

The operator should also keep an escape consciousness during the operation.

It must be ensured that in an emergency, you can immediately escape.


注意

Pay attention to the robot's movements at all times, and do not work on your back.
Slow response to the robot's movements can also lead to accidents.

When an abnormality is found, the emergency stop button should be pressed immediately.
This provision must be thoroughly implemented.


注意

According to the installation site and the content of the operation, the operation regulations and checklists related to the robot's starting method, operation method, and solution to the abnormality should be compiled. And work in accordance with the operation regulations.
Operating only with the memory and knowledge of the operator will cause accidents due to forgetting and errors.


注意

When it is not necessary to operate and operate the robot, turn off the power before performing the work.


注意

When teaching, confirm the program number or step number before proceeding.
Incorrectly editing programs and procedures can lead to accidents.

For the completed programs, use the storage protection function to prevent accidental editing.

After the teaching operation is completed, you should manually check the movement of the robot at a low speed.
If you run at 100% speed in automatic mode immediately, accidents may occur due to factors such as program errors.

After the teaching operation is completed, the cleaning operation should be carried out, and confirm whether you have forgotten to take the tool. The work area is contaminated with oil, and tools are forgotten, which can cause accidents such as falls.
Ensuring safety starts with rectification.

1.2 Transfer and sale the robot


注意

When robots are transferred or sold, it is necessary to ensure that robot-related documents such as operating instructions and maintenance instructions are handed over to new users.
When transferring or selling abroad, the customer must be responsible for preparing the operation and maintenance instructions in the appropriate language, modifying the display language, and ensuring compliance with local laws and regulations.
New users who do not read the instruction manual and perform wrong operations or unsafe operations can cause accidents.


注意

When the robot is transferred, or sold abroad, if there are no special provisions in the contract at the time of the initial sale, the security-related provisions shall not be inherited by the new bearer.
The original client and the new recipient must sign a new contract.

1.3 Discard the robot


注意

Do not disassemble, heat, or incinerate the batteries used in the control device or robot body.

Otherwise, fire, rupture and burning accidents may occur.


注意

Do not disassemble the control board, components, etc. before disposing.

Sharp parts such as cracks or cuts and wires may cause injury.


注意

After the cable and external wiring are removed from the connector and junction box, do not disassemble it further and discard it.

Otherwise, your hands or eyes may be injured due to conductors.


注意

Please be careful not to get caught or injured when discard the robot ,


注意

The robot should be discarded in a safe state.

2 Quality assurance

2.1 product quality assurance

The robot has a 12-month limited warranty.

If new equipment and its components are put into use within 12 months (including transport time, the maximum is not more than 15 months), if there are defects caused by manufacturing or poor materials, Anno Robot (Shenzhen) Co., Ltd. Necessary spare parts are replaced or related parts are repaired.

The ownership of the equipment or components that are replaced or returned to Anno Robot (Shenzhen) Co., Ltd. belongs to Anno Robot (Shenzhen) Co., Ltd.

If the product is no longer within the warranty period, Anno Robot (Shenzhen) Co., Ltd. reserves the right to charge customers for replacement or repair costs.

Outside the warranty period, if the equipment exhibits defects, Anno Robot (Shenzhen) Co., Ltd. will not be responsible for any damage or loss caused by it, such as production loss or damage to other production equipment.

3 Basic instructions

3.1 Mechanical system composition

The robot mechanical system is composed of a mechanical body. The mechanical body is composed of a base part, a big arm, a small arm part, a wrist part and a body pipeline package part. A total of 6 motors can drive the movement of 6 joints to achieve different movement forms. Figure 2.1 shows the definition of the various components of the robot and the movement joints.

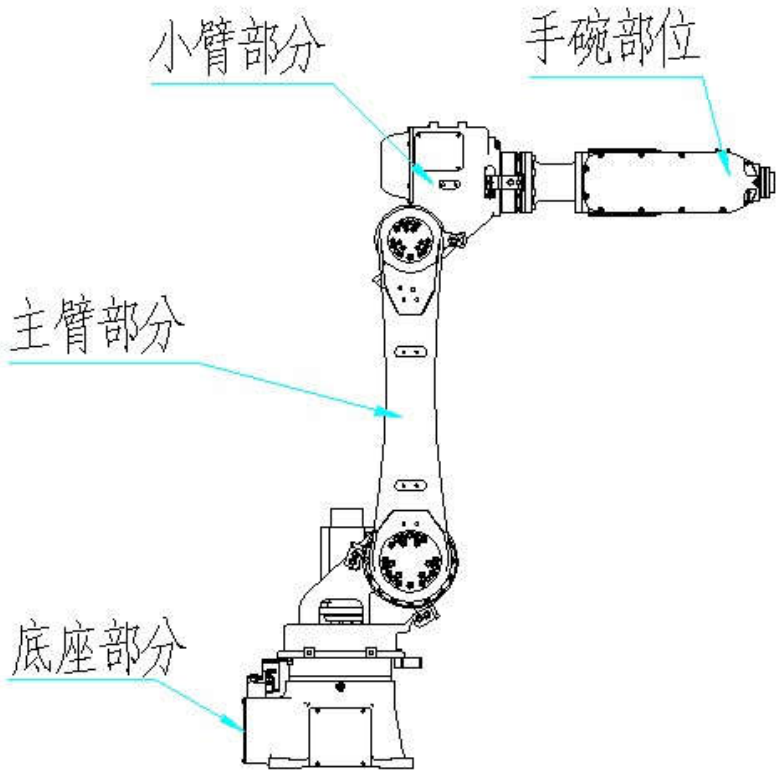


图 2.1　1850-6 机器人

2.3 Mechanical performance parameters

2.3.1 Performance parameter definition

Robot performance parameters mainly include working space, robot load, robot movement speed, robot maximum motion range and repeat positioning accuracy.

1） Robot workspace

With reference to the national standard industrial robot characteristic representation (GB/T 12644), the maximum working space is defined as the set of all points that can be reached by the end of the wrist when the robot is in motion.

2） Robot load setting

With reference to the national standard industrial robot vocabulary (GB/T 12643), the maximum load at the end is defined as the maximum mass that the robot can withstand in any position within the working range.

3） Robot speed

参考国标工业机器人性能测试方法（GB/T 12645），定义关节最大运动速度为机器人单关节运动时的最大速度。

4） Maximum robot motion range

Refer to the national standard industrial robot acceptance rules (JB/T 8896) to define the maximum working range as the maximum angle that each joint can reach when the robot moves. Each axis of the robot has soft and hard limits, and the movement of the robot cannot exceed the soft limit. If it exceeds, it is called overtravel, and the mechanical limit of the axis is completed by the hard limit.

5） Repeatability

With reference to the national standard industrial robot performance test method (GB/T 12642), the definition of repeated positioning accuracy refers to the degree of inconsistency in the distribution of position and posture after the robot responds to the same command posture and repeats N times from the same direction.

2.3.2 Robot performance parameters

1）The table of robot performance parameters is shown in Table 2.1

表 2.1

Model		1850-6
Dof		6
Drivers		ACservo drivers
Maximum motion range	J1	±170°
	J2	＋120° ～－75°
	J3	＋165° ～－100°
	J4	±185°
	J5	±130°
	J6	±360°
Maximum speed	J1	150° /s
	J2	150° /s
	J3	225° /s
	J4	225° /s
	J5	225° /s
	J6	360° /s
Maximum radius of motion		1722mm
Payload		20kg
Repeatability		±0.08mm
Wrist torque	J4	16.6N*m
	J5	16.6N*m
	J6	9.4N*m
Wrist moment of inertia	J4	0.47kg*
	J5	0.47kg*
	J6	0.15kg*
Temperature		0-45℃
Installation conditions		Ground installation, suspension installation
IP		IP65
Body weight		236kg

2） The figure of robot workspace 2.2

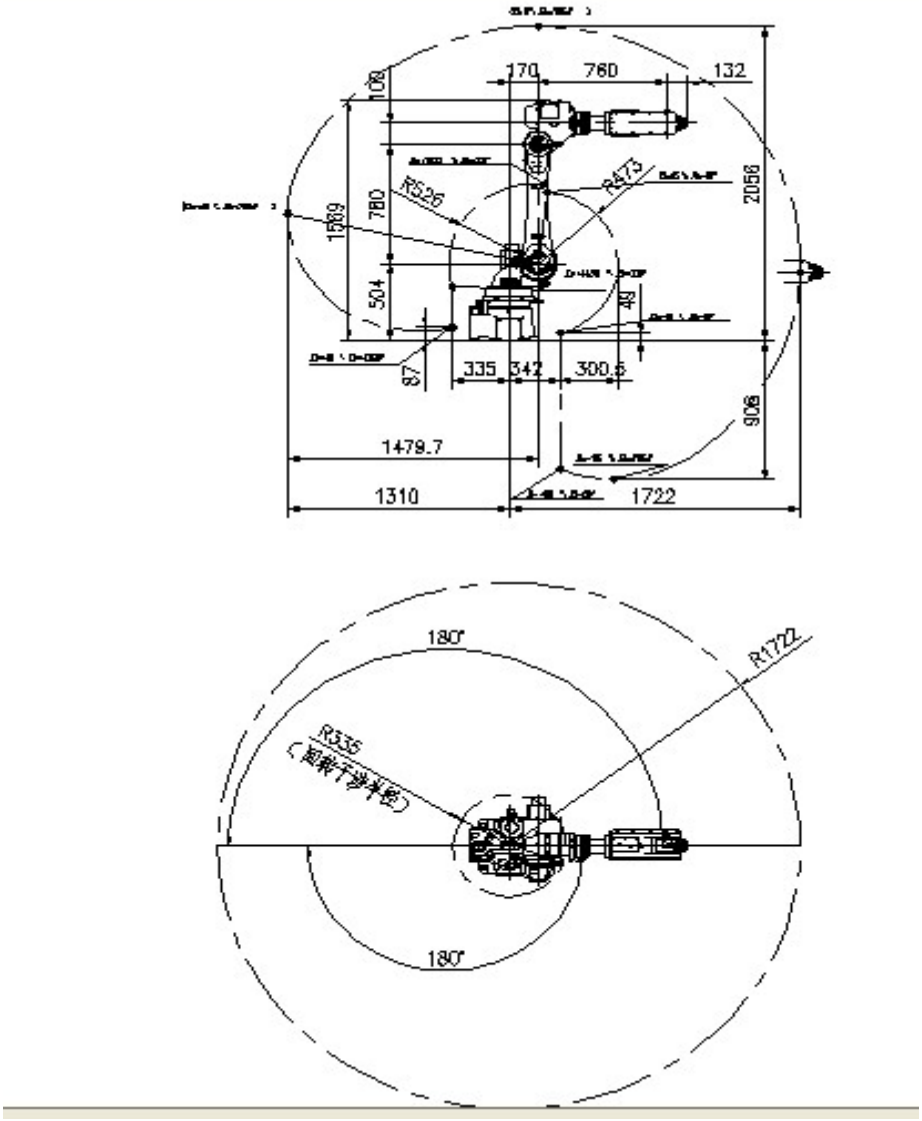


图 2.2　1850-6 机器人工作空间图

3　Installation and handling

3.1 Hang ceiling install

3.1.1 Hang ceiling install method

In principle, a crane should be used to carry the robot. First, install the robot in the posture shown in Figure 3.1. Then, install 4 eye bolts (M12) on the rotating base and lift with 4 steel cables. It is recommended that the length of the steel cable is 2m, and rubber hoses should be put on the parts where the steel cable contacts the robot body for protection.

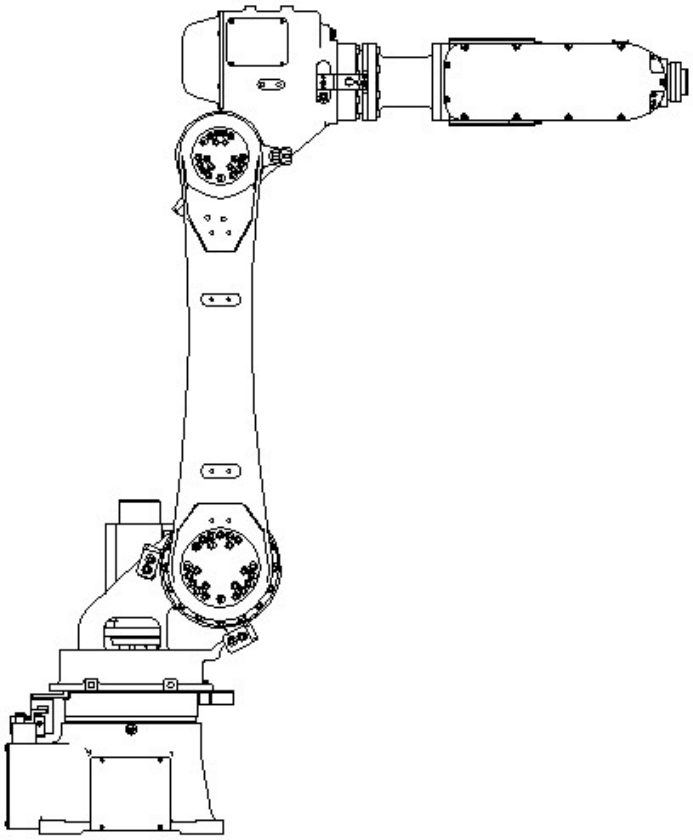


图 3.1　1850-6 吊装示意图

3.2 Install dimensions

3.2.1 Base fixed installation

The robot uses four M14*65 screws to fix the base on the mounting table. The dimension relationship is shown in Figure 3.4

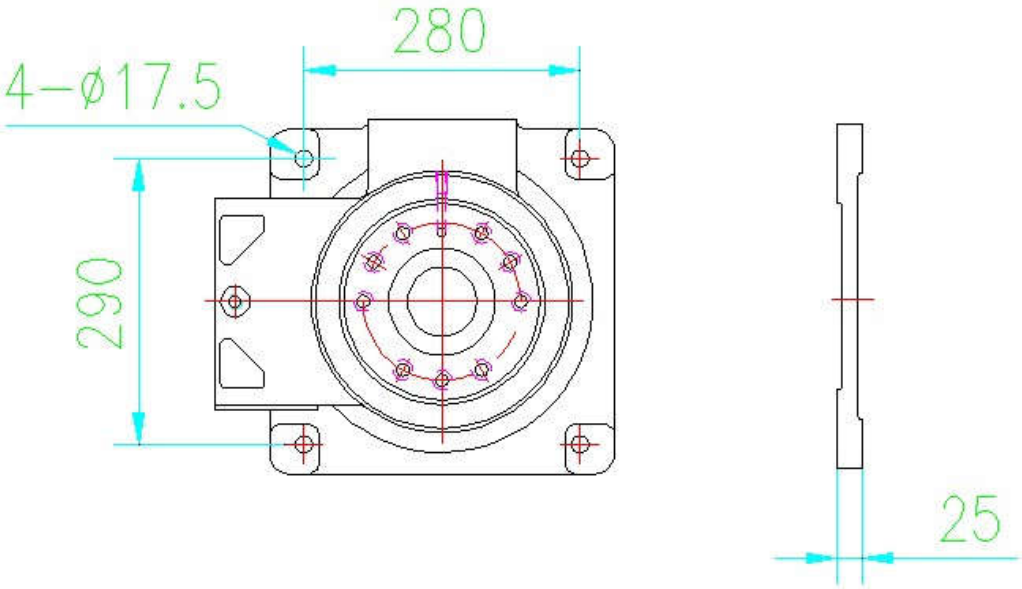


图 3.4

3.2.2 End effector installation dimensions

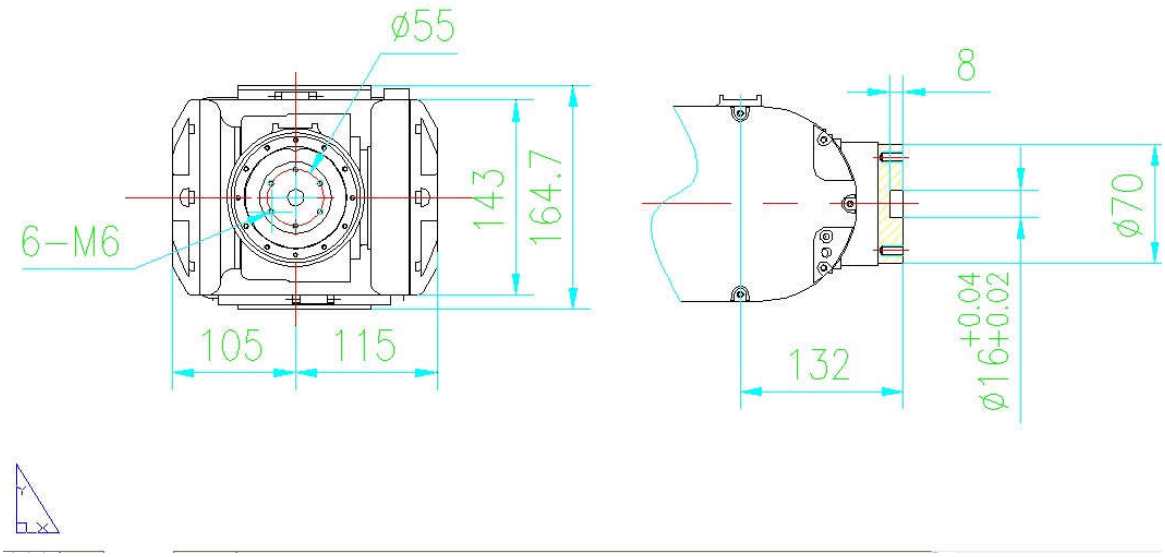


图 3.5

3.3 Allowable part load of wrist

The mounting load on the tip of the robot wrist is affected by the allowable weight of the wrist, the allowable load torque value, and the allowable moment of inertia. The allowable load torque value changes according to the actual load inertia moment.

The wrist load should be strictly controlled within each allowable value. When the robot is used at a wrist load other than the allowable value, normal operation cannot be guaranteed.

1） Payload

表 3.1 Allowable loading weight

Model	Payload
1850-6	20kg

2） Maximum static load torque

表 3.2 Maximum static load torque

Model	Allowable static load torque		
	J4	J5	J6
1850-6	16.6N*m	16.6N*m	9.4N*m

3） Moment of inertia

表 3.3 Max moment of inertia

Model	Allowable moment of inertia		
	J4	J5	J6
1850-6	0.47 kg.m^2	0.47 kg.m^2	0.15kg*

4 Repair and maintenance

In order to enable the robot to maintain high performance for a long time, maintenance and inspection must be carried out.

The check and repair is divided into daily check and regular check. The basic cycle is shown in the figure below. The inspector must prepare an inspect plan and carry out inspect effectively. Please refer to the table below for inspection items.

In addition, the inspect must be performed every 40,000 hours of work or a shorter period of every half of years. The inspect period is based on spot welding operations. It is recommended to carry out inspect and inspect in about 1/2 cycle for loading and unloading operations and other frequently used operations.

In addition, if does not kown the maintenance and adjustment methods, please contact our service department.

4.1 Preventive maintenance

According to the method described in this chapter, perform regular maintenance steps to maintain the best performance of the robot.

4.1.1 Daily inspection

表 4.1 Daily checklist

No.	inspect project	description
1	Abnormal noise	Check whether each transmission mechanism has abnormal noise
2	Interference	Check whether each transmission mechanism is running smoothly and whether there is abnormal jitter
3	Air cooling	Check if the fan behind the control cabinet is well ventilated
4	Inspection of pipeline accessories	Whether the pipeline accessories are complete and complete, whether they are worn, and whether there is corrosion
5	Peripheral electrical accessories	Check the robot external wiring, whether the buttons are normal
6	Leak	Check for leaking lubricant at the oil supply and discharge ports

4.1.2 Quarterly inspection

表 4.2 Quarterly checklist

No.	inspect project	description
1	Control unit cable	Inspect the Teach Pendant cable for improper twisting
2	Ventilation unit of control unit	If the ventilation unit is dirty, cut off the power and clean the ventilation unit
3	Cables in the mechanical unit	Check whether the socket of the mechanical unit is damaged, whether it is abnormally bent, and

		whether the motor connector and the air plug are connected reliably
4	Cleaning and maintenance of various components	Check whether there is a problem with the component and deal with it
5	Fastening of external main screws	Tighten end effector screws, external main screws

4.1.3 Annual inspection

表 4.3 Annual inspection list

No.	inspect project	description
1	Cleaning and maintenance of various components	Check if there is a problem with the part and deal with it
2	Fastening of external main screws	Tighten end effector screws, external main screws

4.1.4 Inspect each 3 years

表 4.4 Inspect each 3 years

No.	inspect project	description
1	Replace the lubricating oil of reducer and gear box	Replace according to lubrication requirements
2	Replacing the lubricant of wrist parts	Replace according to lubrication requirements

Note：

（1） Regarding the cleaning parts, it is mainly the connection of the balance cylinder, around the shaft, and the oil seal of the mechanical wrist to clean cutting and splashing.

（2） Regarding the tightening part, tighten the end effector mounting screw, the robot setting screw, and the screw removed due to maintenance, etc. All screws exposed outside the robot should be tightened. For the installation torque, please refer to the appendix screw tightening torque table. And apply the corresponding fastening glue or sealant.

4.2 Inspection of main bolts

表 4.5

No.	Description	No.	Description
1	Install robot	7	Install J5 motor
2	Install J1 motor	8	Install J6 motor
3	Install J2 motor	10	Install wrist parts
4	Install J3 motor	13	Install the end of fixture
6	Install J4 motor		

Tighten and replace the screws according to the content of replacing parts in Section 5.4. After tightening with a torque wrench at the correct torque, paint and fix it. In addition, pay attention that the bolts that are not loose cannot be tightened with the required torque.

注意

4.3Inspection of lubricating oil

Every 5,000 hours of operation or every other year (<2,500 hours of operation or every half year when used for loading and unloading), please measure the concentration of the iron powder of the lubricating oil of the reducer. If the standard value is exceeded, it is necessary to replace the lubricant or reducer. Please contact our service center.

Necessary tools, etc.

• Lubricant iron powder concentration meter

Recommended Lubricant Iron Powder Concentration Meter Manufactured by Idemitsu Kosei Model OM-810

• Lubricating oil gun (nozzle diameter Φ 17 or less, with oil supply quantity confirmation counting function)

• Sealing tape

During maintenance, if more than necessary amount of lubricating oil flows out of the machine body, please use the lubricating oil gun to supplement the outflow part. At this time, the nozzle diameter of the lubricating oil gun used should be Φ 17mm or less. When the amount of replenishing lubricating oil is more than the amount of outflow, it may cause leakage of lubricating oil or poor trajectory of the robot during operation, etc., which should be noted.

注意

After the maintenance or refueling is completed, in order to prevent oil leakage, seal tape must be wrapped around the lubricating pipe joint and the plug with holes before installation.

It is necessary to use a lubricating oil gun that can clearly refuel. When an

注意

oil gun that can clearly determine the amount of oil to be filled cannot be prepared, confirm the amount of oil to be filled by measuring the change in the weight of the oil before and after oiling.

In the short period of time immediately after the robot stops, etc., when the internal pressure rises, the lubricant may be ejected at the moment when the access port plug is removed.

4.4 Change lubricant

The maintenance of the robot needs to be regularly lubricated and repaired in accordance with the following regulations to ensure efficiency.

4.4.1 The amount of lubricating oil

The lubricants for J1/J2/J3/J4 shaft reducer, motor base gear box and wrist parts must be operated every 20,000 hours or every 4 years according to the following steps (used for loading and unloading, every 10,000 hours or Every 2 years) the lubricant should be replaced. Table 4.6 shows the specified lubricating oil and oil supply.

表 4.6

Model	1850	Lubricant name	Remark
J1 reducer	500cc	MolyWhite RE No.00	Rapid oiling will cause the pressure in the oil bin to rise, causing the seal ring to crack, resulting in oil leakage and The oil supply speed should be controlled below 40cc/10 seconds.
J2 reducer	350cc		
J3 reducer	100cc		
Wrist body part	60cc		

4.4.2 Lubricated spatial or direction

For lubricant replacement or replenishment operations, it is recommended to use the orientation given below.

表 4.7

Supply location	direction					
	J1	J2	J3	J4	J5	J6
J1 reducer	random	random	random	random	random	random
J2 reducer		0°				
J3 reducer		0°	0°			
Motor seat		random	0°			
J4 reducer			random			
Wrist body				0°	0°	0°
Wrist connector						

4.2.3 J1/J2/J3/J4 reducer, motor base gear box lubricant replacement steps

1) Move the robot to the lubrication position described in Table 3.7.

2) Turn off the power.

3) Remove the hexagon socket screw plug PT1/8 of the oil supply and discharge port

4) Provide new lubricating oil until the new lubricating oil flows out from the drain port.

5) Install the hexagon socket screw plug to the lubricating oil supply and discharge port.

5 Troubleshooting

5.1 Method of investigating the cause of failure

About the malfunction of the robot

The robot must be designed so that even if an abnormal situation occurs, the abnormality can be detected immediately and stopped immediately. Even so, because

it is still in a dangerous state, it is absolutely forbidden to continue operation.

There are various cases of robot failure as follows.

1) Once a fault occurs, it cannot be operated until the repair is completed.

2) After a fault occurs, the fault can be restored after a period of time.

3) Even if a fault occurs, as long as the power is turned off, the fault can be run again.

4) Even if a fault occurs, the fault can be run again immediately.

5) It is not the robot itself, but the failure of the system side that causes the robot to behave abnormally.

6) The malfunction of the system side due to the malfunction of the robot side.

Especially in the case of (2)(3)(4), it will definitely fail again. Moreover, in sophisticated systems, even experienced engineers often cannot easily find the cause of failure. Therefore, in the event of a failure, please do not continue to operate, you should immediately contact the security personnel who have received the prescribed training, who will carry out the identification and repair of the cause of the failure. In addition, the

These contents are put into the operation regulations, and a complete system that can be effectively implemented is established. Otherwise, it will cause an accident.

When an abnormality occurs in the operation or operation of the robot, if it is not an abnormality in the control device, it should be considered an abnormality caused by damage to mechanical parts. In order to quickly eliminate the fault, you first need to clearly understand the phenomenon and determine what part of the abnormality caused by the problem.

Step 1 Which axis is abnormal?

The first thing to understand is which axis is abnormal. If there is no obvious abnormal movement and it is difficult to judge, respond

・Are there any abnormal noises

・Are there any abnormally hot parts

・ Investigate whether there are any gaps, etc.

Step 2 Which component is damaged

After identifying the axis where the abnormality occurred, it should be investigated which component is the cause of the abnormality. A phenomenon may be caused by multiple components. Symptoms and causes are shown in the table on the next page.

Step 3 Handling of problem parts

After identifying the problematic parts, proceed as shown in 5.3. Some problems can be dealt with by the users themselves, but for difficult problems, please contact our service department.

5.2 Fault phenomena and causes

As shown in Table 5.1, a fault phenomenon may be caused by multiple different components. Therefore, in order to determine which component is damaged, please refer to the content shown hereafter.

表 5.1

Malfunction / Cause component	Reducer	Motor
Over load [注 1]	○	○
Position deviation	○	○
Abnormal noise	○	○
Vibration during exercise[注 2]	○	○
Shaking when stopped[注 3]		○
Shaft drops naturally	○	○
Abnormal heat	○	○
Fault motion, out of control		○

[注 1]：A phenomenon that occurs when the load exceeds the rated range of the motor.

[注 2]：Vibration phenomenon during operation.

[注 3]：The phenomenon of repeated shaking around the stop position several times during shutdown.

5.3 The inspection method and treatment method of each part

5.3.1 Reducer

When the reducer is damaged, vibration and abnormal sound will be generated. At this time, it will hinder normal operation, resulting in abnormal overload, deviation, and abnormal heating. In addition, it will not move and position deviation.

1) Inspection method

Check the amount of iron powder in the grease: When the concentration of iron powder in the grease increases to about 1000 ppm or more, there is a possibility of internal damage. (Every 5,000 hours of operation or 1 year (<2,500 hours or half a year for loading and unloading applications), please measure the iron powder concentration of the reducer. If it exceeds the standard value, it is necessary to replace For grease or reducer, please contact our service center.)

Check the temperature of the reducer: when the temperature rises up 10° than the normal operation, it can basically be judged that the reducer is damaged.

2) Processing method

Please replace the reducer. Due to the complexity of replacing the reducers, please contact our service department if you need to replace it.

If the J5/J6 axis reducer is faulty, please replace the wrist parts as a whole, see 4.4.1.

5.3.2 Motor

When the motor is abnormal, abnormal phenomena such as shaking and vibration during operation will occur during shutdown. In addition, abnormal heating and abnormal sound may also occur. Because the phenomenon is the same as the phenomenon when the reducer is damaged, it is difficult to determine the cause, so the reducer and balance cylinder components should be checked at the same time.

1) Investigation method

Check for abnormal sounds and abnormal heating.

2) Processing method

Refer to "5.4.2 Replacing the Motor" to replace the motor.

5.4 Replace parts

When handling and assembling replacement parts, pay attention to the weight of each part.

表 5.2

Model	Motor	J2 weight
	J1/J2	
1850	20kg	30kg

Tools

Microcalliper 1/100mm (used to measure positioning accuracy and backlash)

Vernier caliper 150mm

Phillips screwdriver large, medium and small

Flat screwdriver large, medium and small

Allen wrench set M3~M16

Torque wrench

Three-grab Rama

Eye bolts M8~M16

Copper rod

Grease gun

5.4.1 Replace the arm parts

Disassemble

1) Remove the load from the manipulator, workpiece, etc. from the manipulator.

2) Remove the screw (1) of the arm part (note that this process requires lifting the wrist part with a crane or other lifting device 3) Move the arm part away from the robot body.

4) Remove the sealing ring (2).

assembly

1) Remove the impurities on the mounting flange and clean it.

2) Install the sealing ring (2) into the mating flange surface, and apply THREEBOND1110F plane sealant to the mounting flange surface.

3) Lift the arm parts to keep the arm parts level, slowly move closer to the connecting part, align the holes with the two guide rods, and then slowly push into the matching part of the arm

4) Screw the small arm parts to the big arm with screws (1).

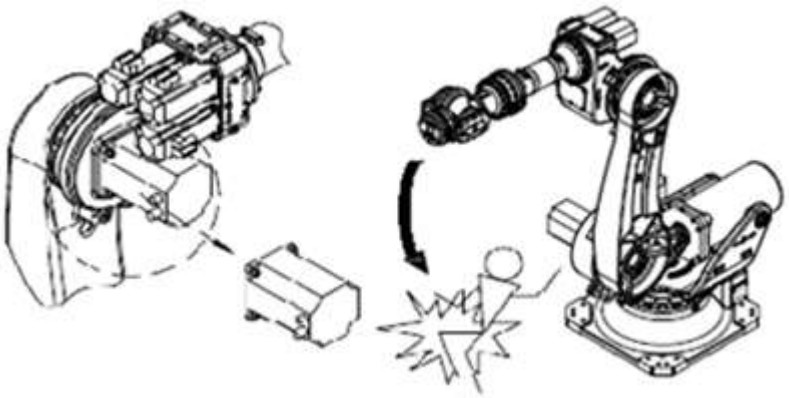
5) Add the lubricating grease.

6) Perform proofreading operation

5.4.2 Replace the motor

Remove the motor without fixing the robot arm. The robot arm may fall or move back and forth. Please fix the arm first, then remove the motor.

注意



After inserting the zero point bolt, fix the mechanical arm with a wooden block or crane to prevent it from falling, and then remove the motor. (The zero point bolt and stopper are used to align the original position, and cannot be used to fix the robot arm.)

In addition, do not remove the motor with the robot arm supported by human hands.

注意

Don't apply force to the encoder connector of the motor. Applying large pressure can damage the connector. If you need to touch the motor immediately after stopping, make sure that the motor is not in a high temperature state, and handle it carefully.

5.4.3 Sealant application

1）Wash and dry the surface to be sealed

Blow the surface to be sealed with compressed gas to remove dust.

To degrease the installation surface to be sealed, use a cloth dipped in cleaning agent or spray the cleaning agent directly.

Blow dry with gas.

2）Apply sealant

Ensure cleaning agent). If it does, wipe or blow dry.

Apply sealant to the surface and wait for the sealant to soften (about 10 minutes). Use a spatula to remove the softened sealant.

3）Assembly

To prevent dust from falling on the part where the sealant is applied, parts should be installed as soon as possible after the sealant is applied. Be careful not to touch the applied sealant. If the sealant is wiped off, reapply.

After installing the parts, fasten it with screws and washers to bring the matching surface closer.

Do not apply lubricant before applying sealant, because lubricant may leak. After installing the reducer, wait at least 1 hour before lubricating.

5.6 Types of sealant

Name	Model
Thread sealant	LOCTITE577
Thread fastening glue	THREEBOND1374
Flat sealant	THREEBOND1110F
detergent	THREEBOND6602T

Name	Model
Thread sealant	LOCTITE577
Thread fastening glue	THREEBOND1374

Flat sealant	THREEBOND1110F
detergent	THREEBOND6602T

5.5 The robot body pipeline package maintenance

For the part from the base to the motor base, the movement range of the line package is relatively small, mainly at the connection between the boom and the motor base. This part will move relative to the body with the movement of the robot. If the pipeline package and the body periodically contact friction Can add anti-collision ball or wrap anti-friction cloth in the friction part to ensure that the pipeline package is not worn or cracked in a short time. The location of adding anti-collision ball is installed by the field application personnel according to the specific station.

1) Replacement of pipeline sit

After a long period of friction with the mechanical body, the pipeline package will inevitably cause the bellows to break or be about to be damaged. In the work of the robot, this situation is not allowed. If the above situation occurs, it is best to replace the bellows in advance (which can be replaced when not in production). The replacement steps are: (1) Determine all the cables in the replacement pipeline package used, loosen the connectors or connections of these cables (2) Loosen the pipe clamp used, remove the corrugated pipe (at this time, pay attention to the marking of the corrugated pipe fixed by the pipe clamp), and pull the cable out of the pipeline package; (3) Cut the same length Pipelines of the same specifications are also marked at the same position for the convenience of installation; (4) Thread all cables into the newly replaced pipeline; (5) Install the pipeline package that penetrates the cable to the machine body (Pay attention to the marked position); (6) Make various cable connectors and connect and fix them.

Appendix

A screw tightening torque table

	Tightening torque（N-m)
M3	2±0.18
M4	4.5±0.33
M5	9.01±0.49
M6	15.6±0.78
M8	37.2±1.86

M10	73.5±3.43
M12	128.4±6.37
M14	204.8±10.2
M16	318.5±15.9

Note: Since the special tightening torque of the motor flange material cannot be too large, please refer to the notes in the table to apply.

Table 5 Sealants and others

Name	Model	QTY	Using Area
lubricating oil	MOLYWHITE RENO.00	4kg	
Flat sealant	THREEBOND 1110F	1	
Thread Fastener	THREEBOND 1374	1	
Detergent	THREEBOND 6602T	2	
Thread sealant	LOCTITE577	1	