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# **Shandong Chenxuan Robot Science and Technology Co., Ltd.**

## **Technical scheme of bending machine bending project**

**Shandong Chenxuan Robot Science and Technology Co., Ltd.**  
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# I. Project Overview

## 1. Project Overview

The scheme mainly selects 3 sets of SDCX-RB series robots and supporting Shandong Chenxuan series controllers and demonstrator, 3 sets of robot grippers, 3 robot bases, 1 set of safety fence, 1 feeding machine, 4 sets of conveying equipment and electrical control system according to the user's process flow.

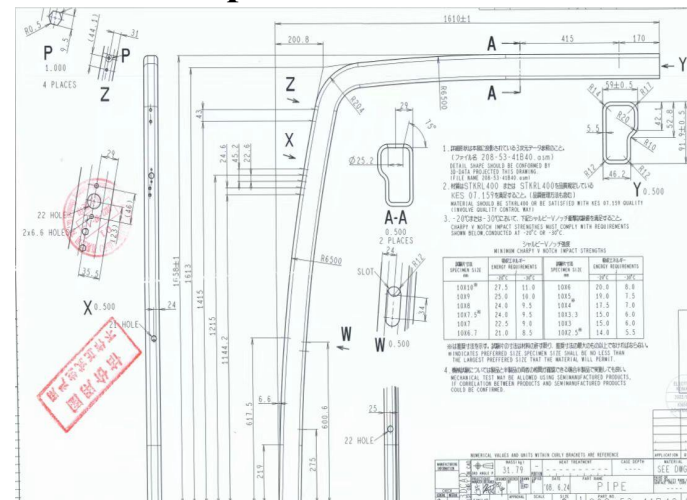
## 2. Project Design Basis

**Loading and blanking objects: Profiled tube**

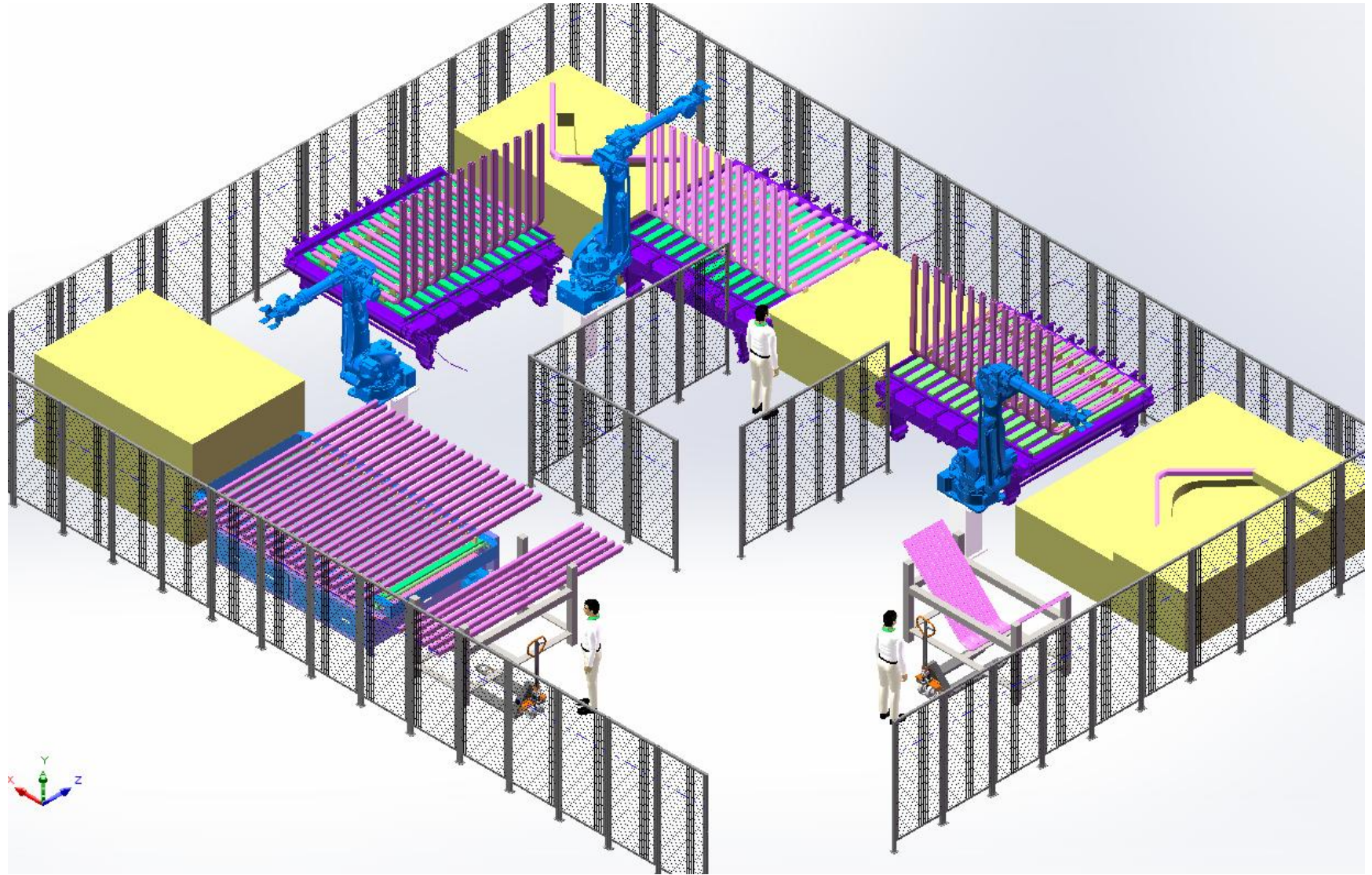
**Appearance of the workpiece: As shown in the figure below**

**Individual Product Weight:  $\leq 32\text{kg}$**

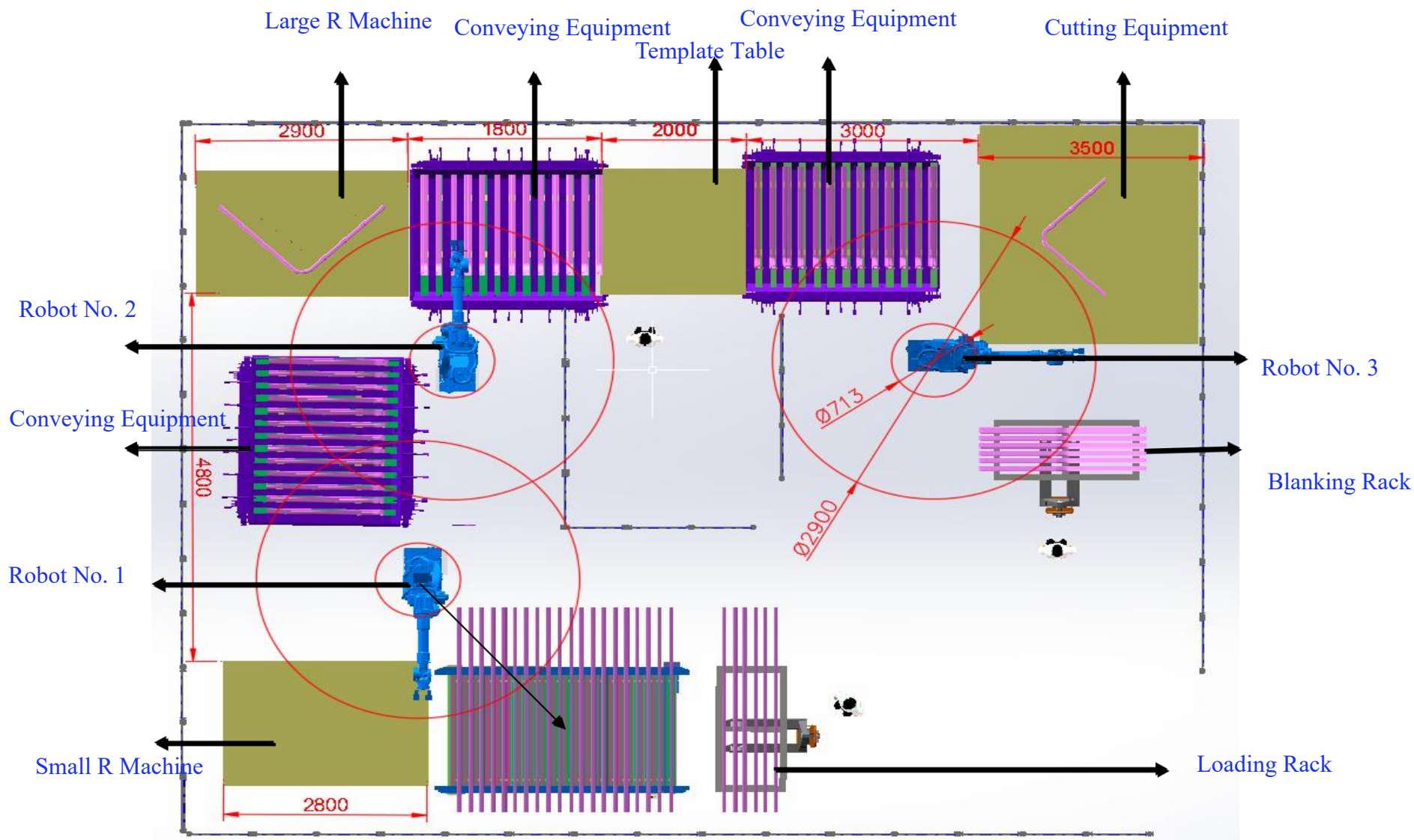
**Technical requirements: Load and unload the machine tool according to the pipe bending process, with functions such as accurate grasping by robots and power failure without falling;**



## II. Scheme Layout



## II. Scheme Layout





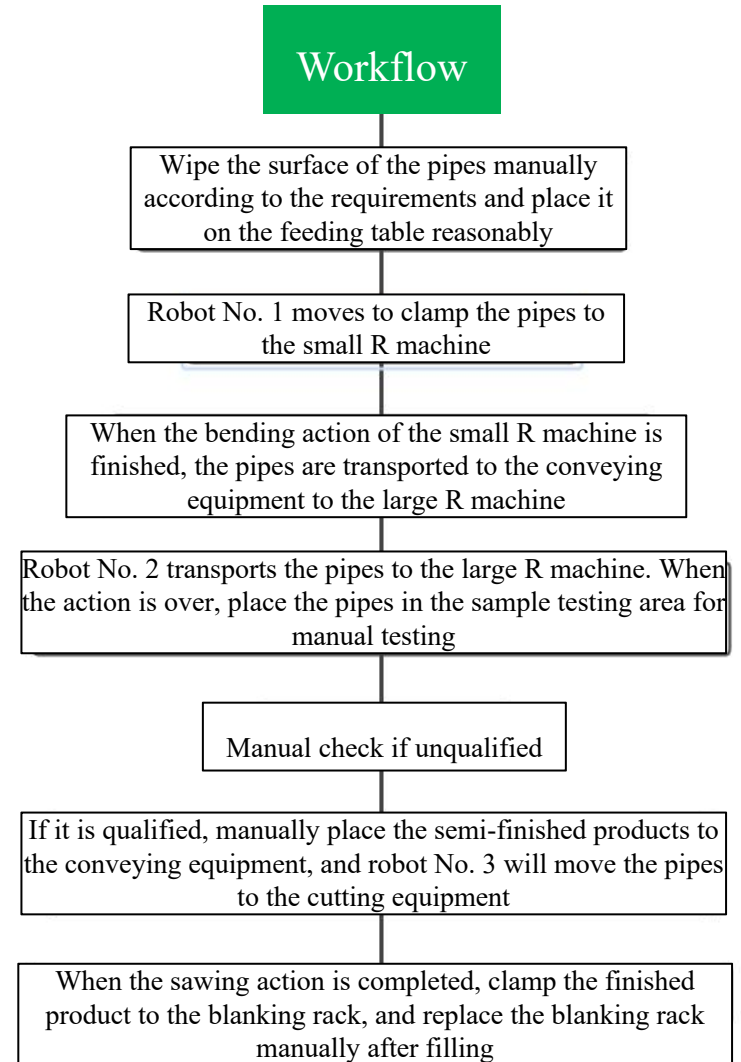
# III. Workflow

## 3.1 Conditions for workstation operation

- (1) Wipe the surface of the pipes manually according to the requirements and place it on the feeding table reasonably;
- (2) There is no alarm prompt after the equipment is powered on and the equipment is ready;
- (3) The robot stops at the work origin, and the robot running program is the corresponding production program.
- (4) Confirm safety door/lock show safety signal and start the workstation.

## 3.2 Description of workflow (as shown at right)

- (1) Robot No. 1 moves to clamp the pipes to the small R machine;
- (2) When the bending action of small R machine is finished, transport the pipes to the conveying equipment to the large R machine;
- (3) Robot No. 2 transports the pipes to the large R machine. When the action is over, place the pipes in the sample testing area for manual testing;
- (4) Manual check if unqualified;
- (5) If it is qualified, manually place the semi-finished product to the conveying equipment, and robot No. 3 moves to transport the pipes to the sawing equipment;
- (6) When the sawing action is completed, clamp the finished product to the blanking rack, and replace the blanking rack manually after filling;



## IV. Equipment List

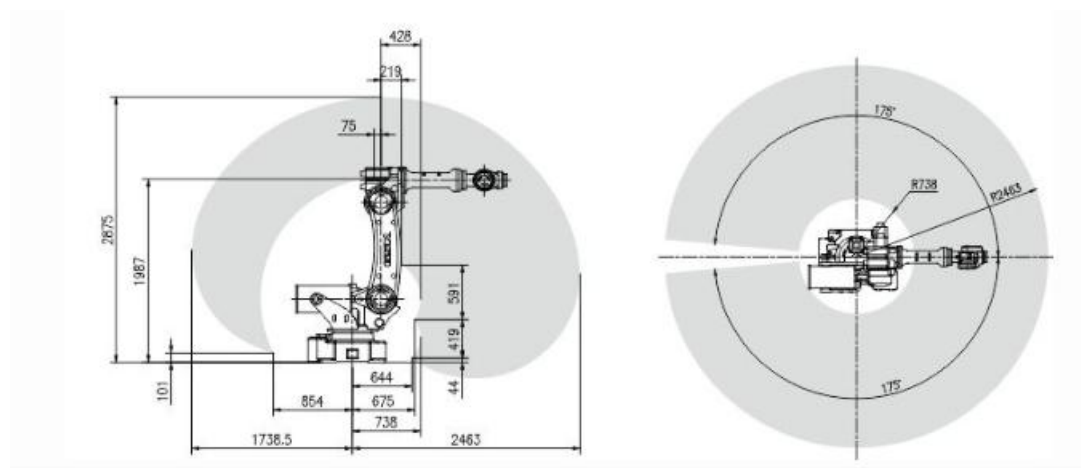


Projects	S/N	Name	Quant ity.	Remarks
Robots	1	SDCX-RB210	3 Sets	Provided by Chenxuan
	2	Gripper Device	3 Sets	
	3	Robot heightened base	3 Sets	
	4	RB Series Controller	3 Sets	
	5	Conveying Equipment	4 Sets	
	5	Safety fence	1 Set	Optional
Related Services	6	Installation and Commissioning	1 item	
	7	Packaging and Transportation	1 item	
	8	Technical Training	1 item	



## V. Technical Description

### 5.1 SDCX-RB210 Robot







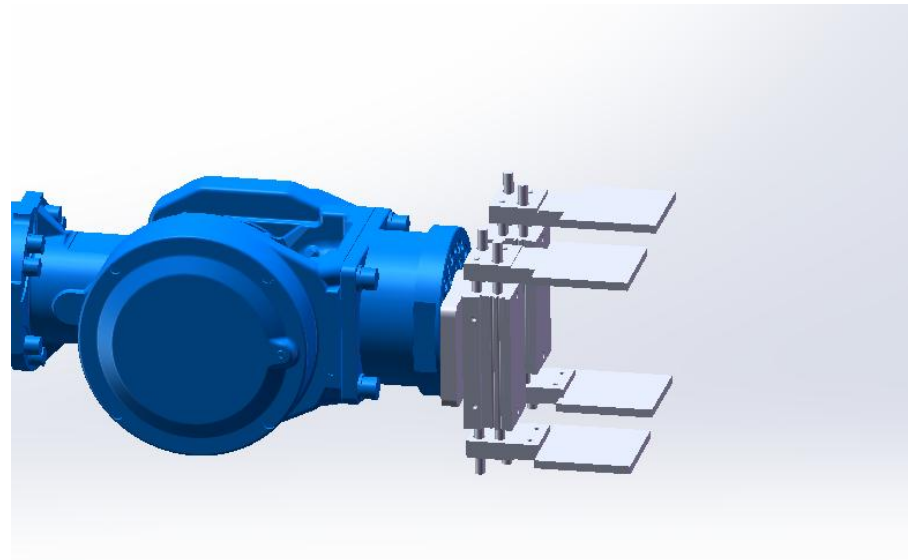
## V. Technical Description

### 5.2 Robot Gripper Device

**(1) The robot adopts double-station pneumatic fixture, to clamp workpiece stably and accurately, realizing automatic and intelligent production process.**

**(2) The maximum weight of a single workpiece to be transported shall not exceed 32 kg.**

**The pictures are for reference only, subject to final design.**

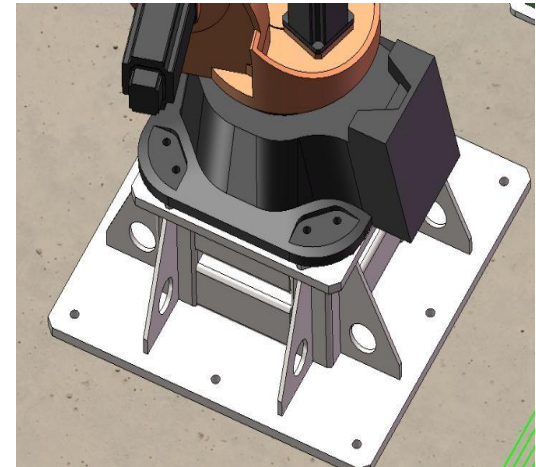




## V. Technical Description

### 5.3 Robot heightened base

**The robot base is used to adjust the installation height of the robot, expand the working coverage area and ensure that the robot stably covers the working point;  
The pictures are for reference only, subject to final design**





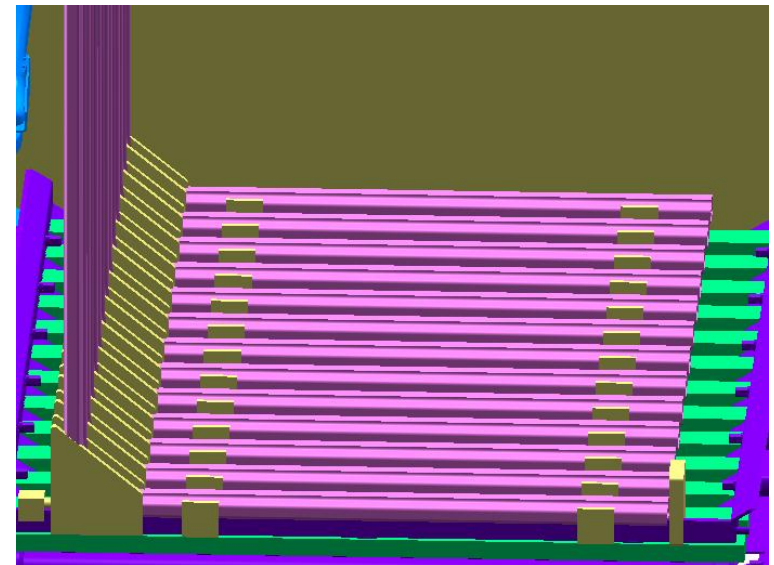
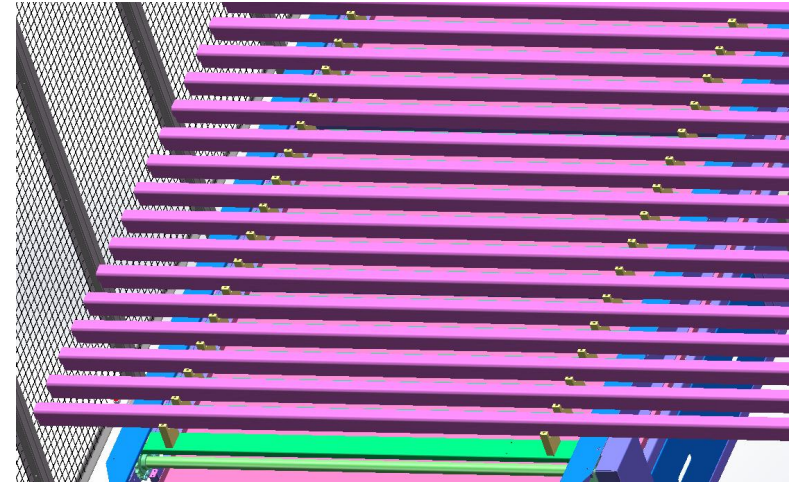
## V. Technical Description

### 5.4 Conveying Equipment

(1) The conveying equipment adopts chain drive with accurate transmission ratio, high power and high efficiency;

(2) The end of the equipment is equipped with sensing facilities to sense the position of workpiece and perform secondary clamping, complete constraints of multiple degrees of freedom, ensure the grasping accuracy of the manipulator, improve product quality;

The pictures are for reference only, subject to final design





## V. Technical Description

### 5.5 Inventory volume and timing evaluation of loading and unloading bin

Work Area	Task	Time
Loading Area	Manual feeding of materials	As the case may be
Small R Machine	Bending	2min
Large R Machine	Bending	2min
Sawing Equipment	Cutting Saw	2min
Robots	Handling	1min
Template Area	Manual testing and placement of workpiece	As the case may be
Blanking Area	Manual removal of products	As the case may be

- (1) It takes about 3 minutes for the robot to complete each process. The three devices run synchronously, which greatly improves the productivity;**
- (2) Man-machine collaboration reduces labor intensity;**
- The pictures are for reference only, subject to final design.**



## V. Technical Description

### 5.6 Teaching Programmer

- 1) Designed according to modern human structural mechanics, the grip is more comfortable;
- 2) LCD touch screen capable of point-touch control facilitates human-computer interaction and improves working efficiency;
- 3) Support hot plug, wired communication, multiple robots can be shared, more universal;
- 4) The function layout is clear at a glance, and you can get started quickly in 10 minutes;
- 5) The pictures are for reference only, subject to final choice;

#### ■ Teaching Programmer Specifications

Projects	Specification
External size	152(W)×53(D)×299(Thick) mm
Gross Weight	0.730 kg
Material	Reinforced plastics
Operating the machine	Select key, shaft operation key, value/application key, switch mode key with key (teach mode, online mode, remote mode), emergency stop, function key, SD card I/F device (SD card is optional), USB port (USB2.0 1 piece)
Display	5.7"TFT color LCD touch screen VGA (640×480 pixels)(Chinese character, hiragana, katakana, English, digital, others)
Protection grade	IP54
Length of cable	Standard: 8m, max (optional): 36m (Additional extension cable)



## V. Technical Description

### 5.7 Safety fence

1. Set the protective fence, the safety door or the safety grating and the safety lock and other devices and carry out necessary interlocking protection.
2. The safety door shall be set at the proper position of the safety fence. All doors shall be equipped with safety switch and button, the reset button and the emergency stop button.
3. The safety door is interlocked with the system through safety lock (switch). When the safety door is opened abnormally, the system stops and gives an alarm.
4. Safety protection measures guarantee the safety of personnel and equipment through hardware and software.
5. The safety fence can be provided by Party A himself. It is recommended to weld with high-quality grid and paint with yellow warning stoving varnish on the surface.





## V. Technical Description

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### 5.8 Electrical Control System

1. Including system control and signal communication between equipment, including sensors, cables, trunking, switches, etc.;
2. The automatic unit is designed with three-color alarm lamp. During normal operation, the three-color lamp displays green; and if the unit fails, the three-color lamp will display red alarm in time;
3. There are emergency stop buttons on the control cabinet and the demonstration box of the robot. In case of emergency, the emergency stop button can be pressed to realize the system emergency stop and send out alarm signal at the same time;
4. Through the demonstrator, we can compile many kinds of application programs, which can meet the requirements of product renewal and adding new products;
5. All emergency stop signals of the whole control system and the safety interlock signals between the processing equipment and robots are connected to the safety system and the interlocked control is conducted through the control program;
6. The control system realizes the signal connection between running equipment including the robot, gripper and machining tools;
7. Machine tool system needs to realize signal exchange with robot system.



## 5.9 Operating environment (provided by Party A)

<b>Power supply</b>	<ul style="list-style-type: none"><li>•Power supply: Three-phase four-wire AC380V±10%, voltage fluctuation range ±10%, frequency: 50HZ;</li><li>•The power supply of robot control cabinet shall be equipped with independent air switch;</li><li>•Robot control cabinet must be grounded with grounding resistance less than 10Ω;</li><li>•The effective distance between the power source and the robot electric control cabinet shall be within 5 meters.</li></ul>
<b>Air source</b>	<ul style="list-style-type: none"><li>•The compressed air shall be filtered out of water, gas and impurities, and the output pressure after passing through FRL shall be 0.5~0.8Mpa;</li><li>•The effective distance between the air source and the robot body shall be within 5 meters.</li></ul>
<b>Foundation</b>	<ul style="list-style-type: none"><li>•Treat with the conventional cement floor of Party A's workshop, and the installation base of each equipment shall be fixed to the ground with expansion bolts;</li><li>•Strength of concrete: 210 kg/cm<sup>2</sup>;</li><li>•Thickness of concrete: More than 150 mm;</li><li>•Foundation unevenness: Less than ±3mm.</li></ul>
<b>Environmental Conditions</b>	<ul style="list-style-type: none"><li>•Ambient temperature: 0~45 °C;</li><li>•Relative humidity: 20%~75%RH (no condensation is allowed);</li><li>•Vibration acceleration: Less than 0.5G</li></ul>
<b>Miscellaneous</b>	<ul style="list-style-type: none"><li>•Avoid flammable and corrosive gases and fluids, and do not splash oil, water, dust, etc.;</li><li>•Do not approach the source of electrical noise.</li></ul>