OPERATION MANUAL

BVW-1000

AUTOMATIC WELDING MACHINE

Purchase date：_____

Product serial number：_____

Model：_____

Warning: Installation, operation and maintenance are NOT permitted before reading this manual carefully.

BUG-O SYSTEMS

A DIVISION OF WELD TOOLING CORPORATION

280 TECHNOLOGY DRIVE CANONSBURG, PENNSYLVANIA 15317-9564 USA

PHONE: 1-412-331-1776 http://www.bugo.com FAX: 1-412-331-0383

CONTENTS

1. Safety Instruction

Warning

In the Bug-O/All-Time Mechanical & Electrical Equip. Co. LTD, equipment is designed and manufactured based on the safety-first criterion. However, correct installation and operation are the most important measures to ensure your safety. Installation, operation and maintenance are all forbidden before reading through this manual and corresponding safety regulations included in it. Most importantly, customers should consider proper installation and maintenance before operation.

1. Beware of electric shock

A. During the welding operation of the worker, the circuit formed between the covered electrode and the workpiece (or the ground) is charged. Exposed skin or moist clothing are forbidden to contact these charged parts. Workers should put on dry gloves with segregated fingers to obtain good insulations.

B. Make sure the equipment and workpiece are properly grounded. If the welding operation must be conducted in the circumstance that may cause electric shocks (in moist places or wearing moist clothes; on the metal structure such as the floor, the palisade and the scaffold; when the body in not stretching such as seating, kneeing or reclining, and the body will inevitably come in contact with the workpiece or the ground in these conditions), the operation should be conducted according to the security specification and the following equipment should be utilized:

- Semi-automatic DC constant-voltage (wire feeding machine) welder
- DC manual metal arc welder
- AC welder with anti-electric function

C. In the semi-automatic and automotive welding process, many parts are charged, such as the wire, the wire-feeding wheel, the welding head, the nozzle and the semi-automatic welding torch.

D. Ensure that the electric cable is firmly connected with the workpiece metal.

E. The workpiece to be welded should be grounded well.

F. Ensure that the electrode holder, the workpiece gripper and the welder should be operated in normal conditions. Meanwhile, the destroyed insulation parts should be replaced in time.

G. Immersion of the electrode into the water to cool is forbidden.

H. Touching two wire holders of different welders simultaneously is forbidden for the reason that the voltage between them may be high up to the sum of their open circuit voltages.

I. In the course of the aloft work, the worker should use safety to avoid dropping.

2. Beware of the arc light

A. When you observe the arc light during the welding process, you should wear a mask with black glass. Appropriate flame-retardant material should be used to protect other persons and warn them not to observe the welding arc light or to keep away from the arc light, the spatter or hot workpiece.

B. The mask with black glass and cover plate is to protect your eyes from burning by the spark or arc light. The mask and black glass must meet the requirements listed in the standard ANSIZ87.1.Wear clothes made of refractory materials to protect skins from burning by the spark or the arc light.

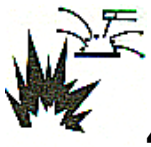
3. Beware of the welding fume

A. The exhausted gas during the welding process is harmful to our healthy, thus we should avoid inhaling these gases. When we conduct the welding operation, The head should be avoided to facing the welding fume and the exhausted gas. Meanwhile, it is necessary to install enough ventilation equipments to keep these gases away from the breathing zone. In the welding process of stainless steels, or layer rich in cadmium (refer to corresponding items on containers and MSDS), or steels containing lead and plated with cadmium with the manual metal arc welding, some poisonous gas and fume will be generated, and then some specific ventilation equipments are needed. In these conditions, try to reduce the direct exposure and local gas exhaustion or mechanical ventilation equipments should be applied when it is lower than the lowest value. In the restrict zones or outdoors, protection masks are needed. It also needs to take protection measures in the course of welding galvanized steels.

B. The welding operations are forbidden near the steam of chloridized hydrocarbons generated in the course of the lubrication, cleanliness or spraying operations. The arc heat and arc light will react with these chloridized hydrocarbon to generate gaseous phosgene and stimulus with virulent property.

C. The shielding gas used for the welding technology is harmful to our body and even leads to death. It is necessary to install enough ventilation equipments to ensure the breathing safety, especially in narrow working zone.

D. Read through and understand the supplied manuals for the equipment and consumables, including the material safety databases (MSDS). And then, be sure to comply with the employer's safety regulations. The MSDS can be obtained from the distributors or the manufacturers.



4. Fire prevention

A. Keep combustibles away from the welding area. If it is impossible, they should be shaded to avoid fires caused by the welding spatter. Keep in mind that welding spatters and hot material can easily flow though the slit in the welding area and then

lead to fire hazard. In addition, the welding operation near the pipeline for the fuel gas should be forbidden and the fire fighting equipment should be equipped instantly.

B. When the compressed gas is needed in the work site, specific measures must be taken to avoid the occurrence of execrable incidences. Corresponding items can be referred to the “Welding and Cutting Safety” (ANSI standard A49.1) and the operation instructions.
C. When the welding operation is not conducted, be sure that the electrode circuit does not contact with the workpiece or the ground. A sudden contact may lead to overheat and then the fire.
D. When we do not take proper measures and do not make sure whether some combustible or poisonous gas may be generated, the heating, cutting or welding of a oil tank, barrel or other vessels are all forbidden. The explosion may occur even when it is cleaned. You can purchase the “Safe Practices for the Preparation of Containers and Piping for Welding and Cutting” from the American Welding Society (AWS) and the code is AWSF4.1.
E. Make sure that the empty casters or vessels are exhausted totally before the heating, cutting or welding operation. Otherwise, there is a possibility to result in explosion.
F. There is sparks and spatters in the welding course, the welding worker must put on the oil-free protection clothes, such as fur-lined gloves, dark shirt, trapped pants, high-waist shoes and cap. When the welding operation is conducted at abnormal positions or narrow places, wearing earplug is also necessary. In the narrow area, the protection eyeshade with lateral shade is also needed.
G. During the welding operation, the connection between the working cable and the workpiece should be as close as possible. When the working cable is connected with the building structure or other places away form the welding area, it is liable to make the welding current flow through the lifting chain, the lifting rope or some other stand-by circuit and this will lead to fire or the overheat of the lifting chain until its dropping.

5. Cylinder has a danger of explosion

A. Only gas cylinders containing accurate compressed shielding gas for welding can be used, and the regulation of the gas pressure must be conducted correctly. Moreover, all used hoses and accessories must meet the application requirements and be in good condition.
B. Utilize the tripod or the fixed support to fasten the gas cylinder and keep it in the vertical position. The gas cylinder should locate at:
   a) the place that may cause beaten or physical damage.
   b) the place away at a safe distance from the welding or cutting operation, the gaseous heat resource, fire and spatters.
C. The contacts of the covered electrode, the electrode holder of some other charged objects to the gas cylinder are forbidden.
D. Worker’s head and face should not face the export of gas valves when they are screwed open.
E. The valve protection should be kept at correct place and be screwed tightly unless it

will be used or is being used.

F. You can obtain the P-1 “Safe Handling of Compressed Gas in Containers” published by CGA from the compressed gas organization-----Jefferson Daves Highway, Arlington, VA22202. Read through and understand the items on compressed gas cylinders and corresponding equipments.

6. Notes for electrical operations

A. Utilize the opening switch on the fusing box to cut off the input power source before operating this equipment.

B. Install the equipment according to the national electrical requirements, local laws and regulations and the suggestions from the manufacturer.

C. The equipment should be grounded according to the national electrical requirements and the suggestions from the manufacturer.

7. Equipments that can be classified into internal combustion engines

A. The engine should be shut down before the troubleshooting and maintenances unless it needs to run during the maintenances.

B. The engine should be operated in an open place with good ventilation conditions, or else the waste gas must be exhausted outdoor.

C. The refueling is forbidden near the welding arc or when the engine is running. The engine should be stopped and then refuel until it cools down, avoiding the spilling fuel volatilizes to contact to the hot parts of the engine and then fire is caused. If the fuel spills out, then engine can be started only when the spilling fuel is wiped clean.

D. Keep the safety covers and devices being at appropriate places and the maintenance should be conducted on time. During the starting, operation and maintenance of the equipment, the hair, clothes and tools should be kept away from V-belts, gears, fans and other moving parts.

E. Sometimes, the protection cover must be disassembled to facilitate the maintenance. Keep in mind that the protection cover can be disassembled if it is necessary and it should be recovered quickly after the maintenance. In addition, it is necessary to be cautious when you work near moving parts.

F. Hands are forbidden to be near the fan. When the engine is running, it is forbidden to push the control lever of the gas throttle forcedly regardless of the speed governor or the idler wheel.

G. When the engine or the welding power source is rotated during maintenance, connections of the sparkplug, the ignition distributor, the electromagnetic generator and others must be disconnected to prevent the accidental starting of the gasoline generator.

H. To avoid scalds, the pressure cover of the radiator is prohibited to open when the engine is still hot.

8. Electromagnetic fields are harmful to human bodies

A. The current flowing through any conductors will generate a electromagnetic field (EMF), thus then welding current will generate an EMF near the welding cable and the welder.

B. The cardiac pacemaker will be interfered in an EMF, thus welding workers who has cardiac pacemaker must consult to doctors before the welding operation.

C. When exposed in the EMF during the welding operation, it may results in some other unknown effects to the human body.

D. All welding worker must follow the following measures to reduce the exposure extent of the EMF area in the welding circuit.

1. coil the covered electrode and the working cable together and fasten them with rubberized fabric if it is possible.
2. the coiling of the welding cable around body is prohibited.
3. the body is prohibited to locate between the covered electrode and the working cable. That is to say, the working cable should be located on you right if the covered electrode cable is on you right.
4. the working cable should be as close to the workpiece as possible.
5. work in the vicinity of the power source is prohibited when the welding operation is conducted.

2. Technical Specifications

Serial number	Items	Parameters
1	Power supply scope	240V/380V/440V/3ph/50/60HZ
2	Suitable environment and climate conditions	● Temperature: -30o ~+50 o ● Relative humidity: above 90% ● Grades of dustproof and waterproof: design according to the grade IP23 ● Insulation grade: grade F
3	Diameter of welded tank	≥4.5 m
4	Applicable plate amplitude	Continuously adjustable in 1.5~3.0m
5	Applicable welding position	Vertical butt welding

3. Brief Introduction of Products

3.1 Product Overview

EGW-BUG automated vertical welding machine, which is designed and manufactured by the Bug-OAll-Time Mechanical & Electrical Equip. Co., Ltd, is a high-efficient automated vertical welding machine. The product is designed according to the requirements of manufacturing and installation of large scale cylinder, furnace, ship and storage tank and equipped with welding power source and EGW carriage machine.

3.2 Configurations

The complete product package consists of the following parts listed in Table 1.

- Welding power source and bench,
- Control cabinet for power distribution,
- Enclosed windproof welding machine frame equipping with traveling system
- Power distribution control system,

Table 1 Configuration of EGW-BUG Automatic Welding Machine

No.	Component	Specification/Model	Qty.
1	Power supply bench and power distribution control cabinet	1750mm(L)×1140(W)× 1200(H)	1
2	Forward windproof standard welding frame	1700mm(L)×2000mm(W) × 4000mm(H)	1
3	Control cable	1.5 mm²× 9p× 60m	1
4	Power supply cable	(4mm^2 ×3+2.5mm^2 ×2)× 60m	1
5	Welding cable	120mm²× 60m	1
6	Welding earth wire	120mm²× 10m	1
7	Circulating water pipe (in/out)	3m/3m	1
8	CO2 heater	AC220V/1P/50/60Hz	1

3.3 Performance and Characteristics

● Welding Power Source and Bench, Control Cabinet for Power Distribution

The power source is installed in the bench illustrated in the figure. In addition, this bench is also used to store the welding cable, the control cable and construction tools. At the

side of the bench, a control cabinet is equipped to supply a three-phase AC 380V/50Hz power source and supply a single-phase alternating current 220V/50Hz /60Hz and 110V/50Hz/60Hz for the walking device for machine frame and power distribution control system (carriage, and electromagnet are available)

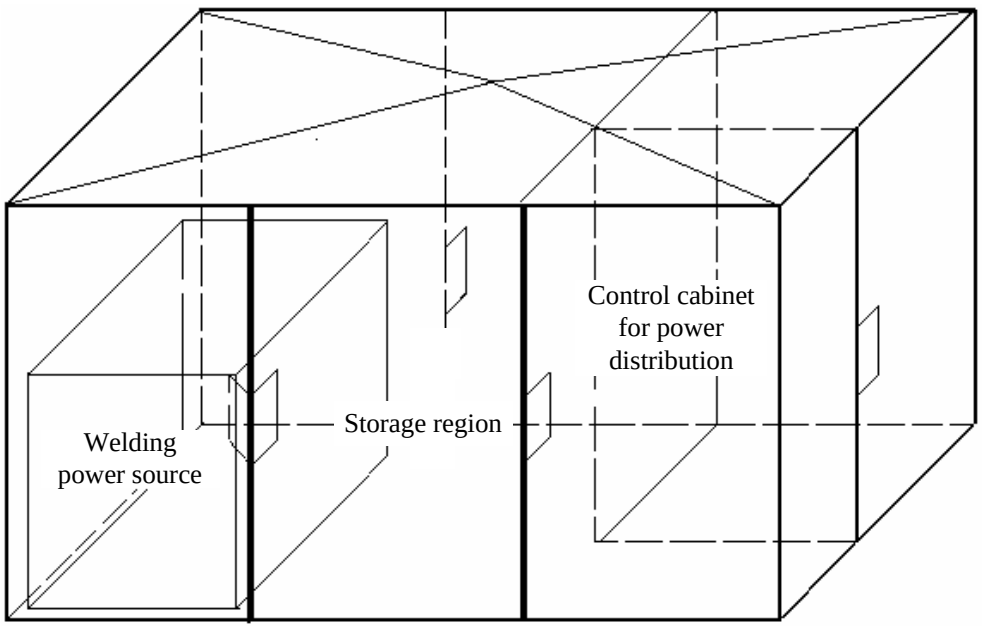


Fig. 1 Schematic diagram of welding power source bench and control cabinet of power distribution

● **Enclosed Welding Machine Frame with Double-side Windproof**

The main body of the windproof welding machine frame is an A-type structure, as shown in **Fig. 2**.

Fig. 2 Schematic diagram of the windproof welding machine frame

During the vertical electrogas welding of large tanks, the windproof welding machine frame plays the role of wind preventions. Meanwhile, it is the installation basement of the guide system of the welding walking trolley, the wire feeding machine, the circulating water system, the lighting system and the transverse walking system. The whole framework is a welded steel structure constructed by the square steel, the channel steel, the angle steel and the steel pipe. At the lateral side of the framework, it is covered with the aluminum plate or color steel plate and the japanned leather to enclose and prevent wind. The main parts are shown as follows:

1. Top platform and guardrail:

The top platform and the guardrail are designed for the waterproof of the welding machine frame and the safety of the lifting operation. The top platform is made of checkered plate with thickness 3mm and there are the hole for upper and lower for the installation personnel, as shown in **Fig. 3**. At four corners of the top platform, there are

four symmetric lifting eye for the lifting of the machine framework.

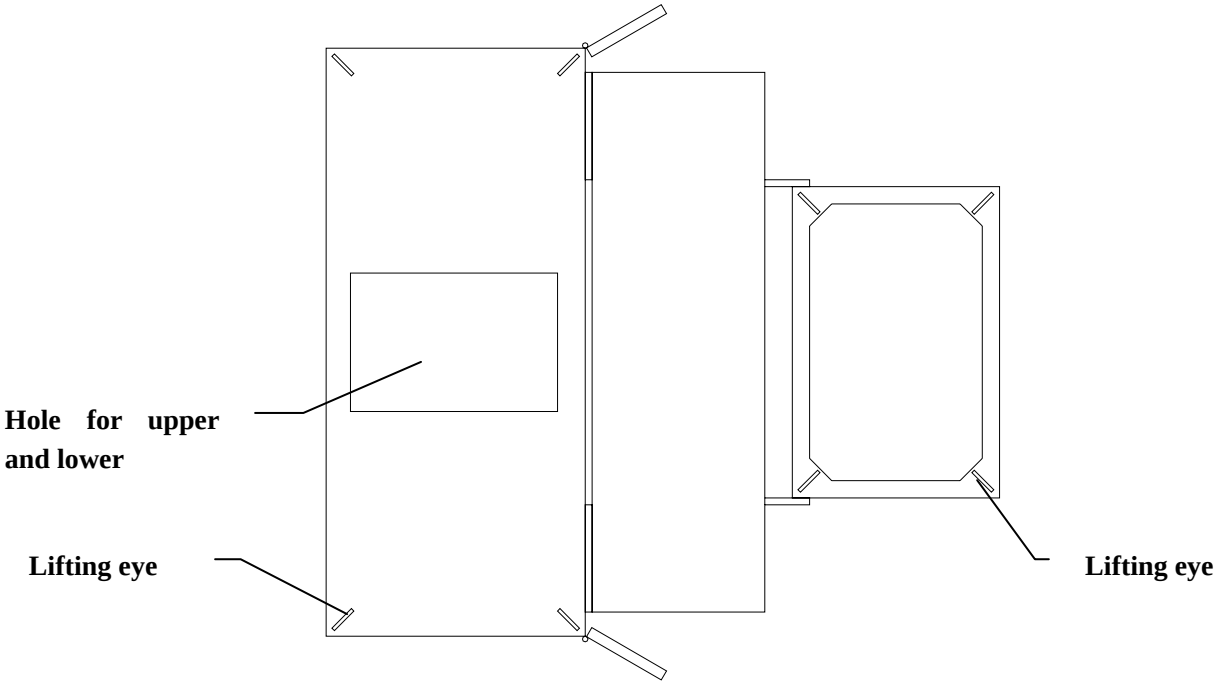


Fig.3 The top platform

2. Transverse walking device for the machine framework:

The transverse walking system is composed of the mechanical transmission part and the electric control part. There are three components in the mechanical transmission part and they are the speed reduction motor, the driving wheel and the driven wheel, as shown in **Fig. 4**. Both the driving component and the driven component can move up and down along with the adjustment installed on the four columns at two sides of the machine framework, which can be used to adjust the complete framework according to different plate amplitudes. The adjustment range is 1500mm~3000mm.

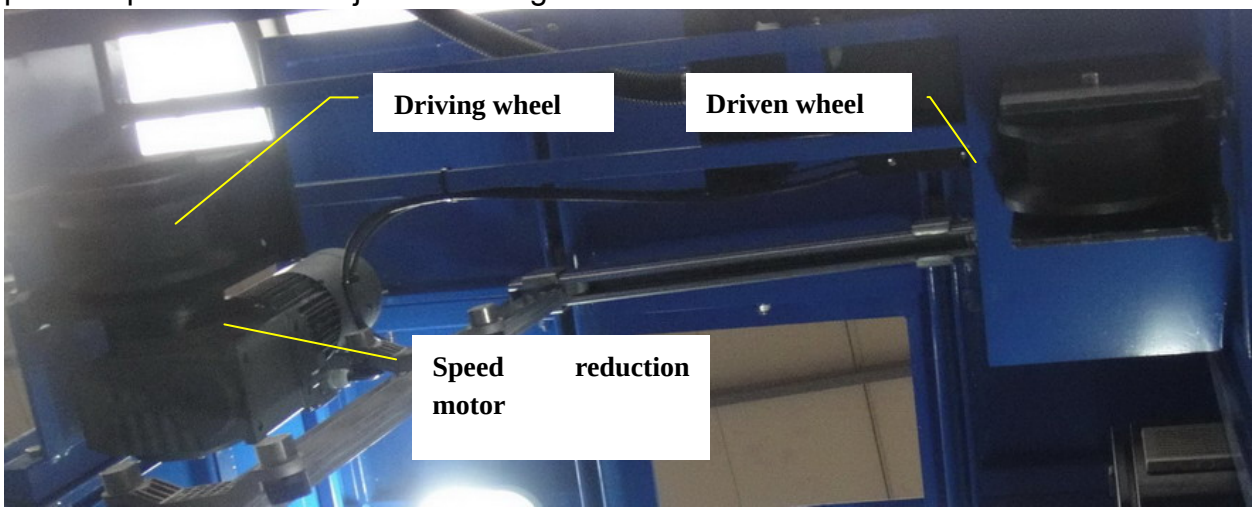


Fig.4. Transverse walking system of the machine framework

Frame walking motor is controlled by frequency converter. Walking speed is controlled by setting frequency as well as acceleration and deceleration time on the frequency converter. The frequency converter is installed inside walking control cabinet. Walking operation is centralized on hand control box.

3. Lighting and smoke exhaustion：

In front of and behind the operation position inside of the machine framework, there are AC 220V/50Hz explosion-proof lamps, as shown in **Fig. 5** and they are used to assemble the welding groove, the welding torch and the slider.

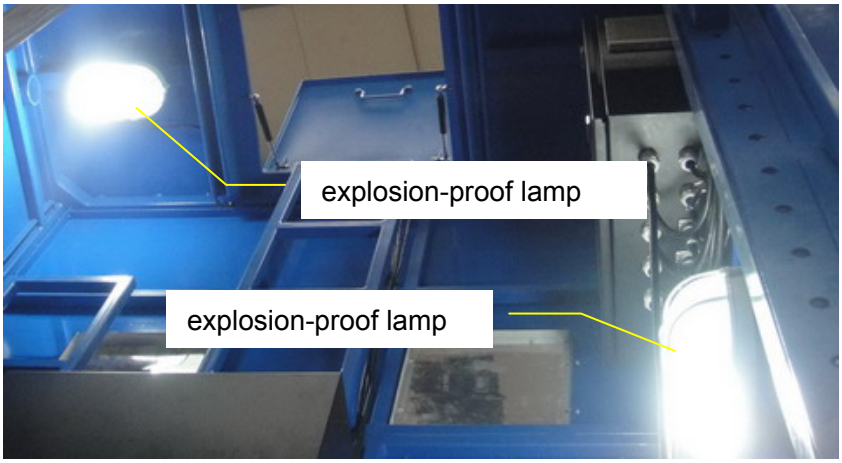


Fig.5. Lighting

Both the vertical Mig welding and self-shielded welding with flux-cored wires, produce a large amount of welding fumes. To improve the operation environment and reduce the harm the welding fume to operators inside of the machine framework, a ventilation fan and a smoke exhaustion system are installed above the welding machine framework, as shown in **Fig. 6**.

Fig.6. Smoke exhaustion system

4. Gas cylinder rack

The gas cylinder rack with an “L” shape, which has a height 1.1m, can be used to lay 2~3 gas cylinders for the CO_2 gas. Furthermore, this gas cylinder can move along with the welding machine framework. The standard gas cylinder is located in front of the

operation platform outside of the machine framework, while the exporting gas cylinder is located on the top of the machine framework.

5. Cable bridge rack

The cable bridge rack installed on the lateral surface in the upper part of the machine framework, which can rotate 180^{o} axially, is to ensure that the position of the welding power source is not unchanged whenever the welding process is conducted inside or outside of the welded tank.

6. Lifting operation platform and lifting device

The lifting operation platform and the lifting device are installed inside of the machine framework and they can be lifted up and down to ensure that it is convenient to observe the welding process and conduct the operation. Elevating platform is controlled by the frequency converter. High speed or low speed can be selected according to practical requirement. The platform is provided with ascending and descending limits. When the platform runs to a limit position and touches the limit switch, it will stop automatically. Their structures are shown in **Fig. 7**.

Fig.7. Lifting operation platform and lifting device

4. Installation Introductions

4.1 Security Notices

The equipment installation is forbidden before reading through installation instructions in this manual.

Warning
Beware of electric shock

● Persons who install the equipment should be professionally qualified.
● Before installation, the input power switch should be switched off.
● The work-piece to be welded should be grounded well.

4.2 On-site Installation

After the EGW-BUG vertical welding is delivered to the construction site, the installation of the machine framework should be conducted according to the plate amplitude. The assembly operation may be carried out according to the following steps:

● **Installation of the Power Source Rack (Electric Power Distribution Cabinet)**
The power source rack (electric power distribution cabinet) should be installed close to the storage tank or vessel to be welded. Meanwhile, it should be considered that the welding cable and the control cable do not cross the service road and the location of the power source rack is near the power network as possible. Additionally, it must be grounded well. When several welding machines are applied simultaneously, they can be lay symmetrically according to the cable length and the tank size.

● **Assembling of Parts Inside of the Machine Framework**
Parts inside of the machine framework are composed of the lifting device, operation platform, the guide, the lighting, smoke exhaustion, cables and the transverse walking. The parts of the machine framework are assembled before leaving the factory and there is nothing but height adjustments of the driving wheel on site according to the real plate amplitude. The adaptation range of this EGW welding machine on the plate amplitude is 1500mm-3000mm.

● **Installation of Parts Outside of the Machine Framework**
In this part, installations of the cable bridge, the gas cylinder rack, the top platform and guardrails are included.

Warning: When connecting or disconnecting cables, turn the main power switch to the off position.

● Lifting of the Machine Framework

Notice: Make sure not to allow the frame to collide with the structures under construction in hoisting the frame, especially when the frame has been set on the tank wall, but to use the top wheels of the frame at front and rear to hold against the tank wall, instead of making the tank wall collide with the frame;
The hoisting rope can be loosened only when both the drive wheel and driven wheel of transverse walk frame have been set on the wallboard.

The angular separation formed between the hoisting ropes is no less than 60°. During the hoisting, pull out the bolt, rotate the top wheel 90°and pull back the bolt making the top wheel surface vertical to the ground level (to make sure that the track supporting wheel will not collide with the tank wall during hoisting) . After that, set down all the traveling wheels of the frame on the tank wall. Pull out the bolt of the flexible top wheel after finishing hoisting, rotate the top wheel 90°, pull back the bolt making the top wheel surface parallel to the ground level, and take back the flexible top wheel.

4.3 Operation Instructions

Security Notices

The equipment operation is forbidden before reading through operation instructions in this manual.

Warning

Beware of electric shock

●Exposed skin or moist clothing is forbidden to contact these charged parts.
● Make sure that you are insulated with the work-piece and the ground.

● Put on dry gloves with segregated fingers to obtain good insulations of both hands.

● Utilize the opening switch on the fuse box to cut off the input power source before operating this equipment.

To protect your and other people's safety, please read through the following warnings.

Beware of the welding fume

- The head should avoid facing the welding fumes.
- It is necessary to install enough ventilation equipment, and the breath safety should be ensured especially in the narrow working area.

Fire prevention

- Flammable and explosive materials should be kept away from the welding area.
- There are sparks and spatters in the welding process, thus welders must wear oil-free protective clothing.

Arc light

- Wear a mask to protect eyes from burning by the spark or arc light.
- Wear clothes made of refractory materials to protect skins from burning by the spark or arc light.

Instructions of the Operation Panel

- The Operation Panel of the walking carriage, please see BUGO carriage manual.
- The Operation Panel of pendant, please see the **fig. 8.**

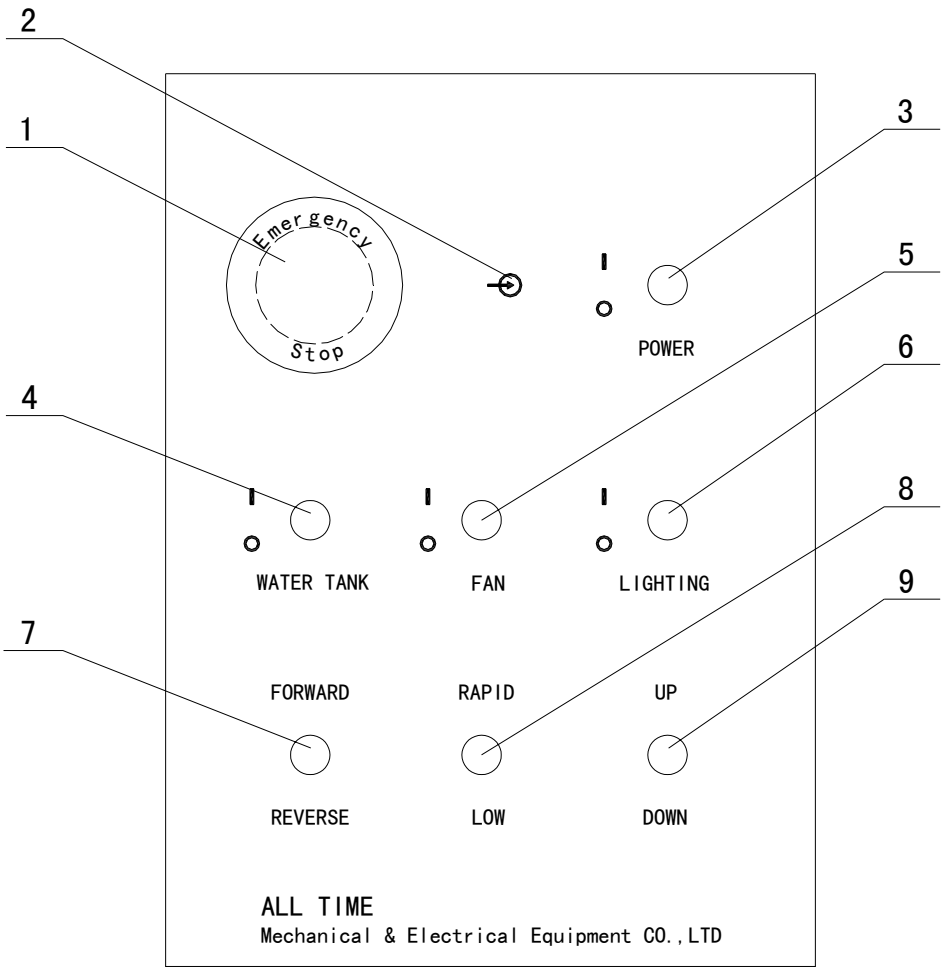


Fig.8. Operation Panel of Pendant

1. Emergency stop button CS1

It is used for switching off all outputs of control cabinet in emergency circumstances.

2. Source indicator lamp CPL1

When power switch CS2 is switched on, source indicator lamp CPL1 is on.

3. Power switch CS2

It is used for controlling switch-on of source.

4. Water tank switch CS3

It is used for controlling on-off of water tank.

5. Turbofan pump switch CS4

It is used for controlling on-off of turbofan pump. Exhaust fan shall be opened to exhaust welding smoke dust in welding process.

6. Illuminating lamp switch CS5

It is a switch for controlling illuminating system in the frame.

7. Walking motor switch CS6

When vertical welding machine needs walking transversely along wall tank, the switch is switched on to select positive or negative walking.

8. Speed selection switch CS7 of elevating platform

Control the elevating platform to run at a high or low speed.

9. Elevating platform switch CS8

Control the platform to ascend or descend.

5. Maintenances

Security Notices

The equipment maintenance is forbidden before reading through maintenance instructions in this manual.

Warning

Beware of electric shock

- The equipment should be maintained by those who have professional qualifications.
- Before the operation, be sure to switch off the input power source.
- It is forbidden to touch the regions giving off heat.

To guarantee normal services of equipment utmost, periodic maintenance should be carried out. Once there are some abnormal phenomena, we must stop to repair. Only if the normal operation is confirmed can it be reused.

5.1 Routine Maintenances

Cut off all the conducting wires which are connected with the power source, and then carry out the routine maintenances.:

- **Examine the Cleanliness Condition of the Machine Framework**
  -----Examine whether there is dust or other goods blocking the driver or sliders or not. It needs to keep the machine framework clean.

- **Examine the Adhesive Spatters**
  -----Examine whether there is adhesive spatters on the basement, the guiding axle of supporters, walking wheels of the welding trolley, the sliding axle and screws or not. If adhesive spatters exist, they need to be cleaned immediately.

- **Examine the Tightening Degree of Bolts**
  -----Tighten those loose bolts.

- **Examine the Insulation Condition of the Welding Torch**
  -----Examine the insulating layer of the welding torch and it need to be examined after every damage.

- **Examine the Cables and the air hole**
  -----Examine the damage condition of the cables and the air hole.

- **Examine the Operation Noise**
  -----Examine whether there is some operation noise from the supporter or not. If there is, check whether the working of the machine framework runs normally.

5.2 Periodic Maintenances

When the running time exceeds 3 mouths or 300 hours, it needs to stop to examine and maintenance the welding machine.

● **Examine Gear Conditions for the Walking and Transmission of the Machine Framework and the Welding Trolley**
  -----It needs to be exchanged if the transmission gear is damaged.

● **Examine the Clean Degree of the Inner Supporter and the Control Box**
-----It needs to keep the inner supporter and the control box clean all along.

● **Examine the Wear Condition of the Driving Wheel and the Pulley**
  -----It needs to be exchanged if there are some damages.

6. Fault Causes and Solutions

Security Notices

If some faults occur on the equipment, repairs must be carried out. Only if the debugging is finished can it be used. At the same time, the maintenance should carry out the maintenance and repair after accepting professional trainings. Before the maintenance and repair is conducted, read the following instructions carefully. Meanwhile, safety points for attention in this manual must be abided by strictly. After all the maintenance and repairs are finished, we should make sure that the normal operation of the equipment can be achieved and then it can be used again.

Warning

Beware of electric shock

- Maintenance and repairs of the equipment must be conducted by those who have professional qualifications.
- Before the operation, be sure to switch off the input power source.
- It is forbidden to touch the regions giving off heat.

6.1 Troubleshooting Guides：

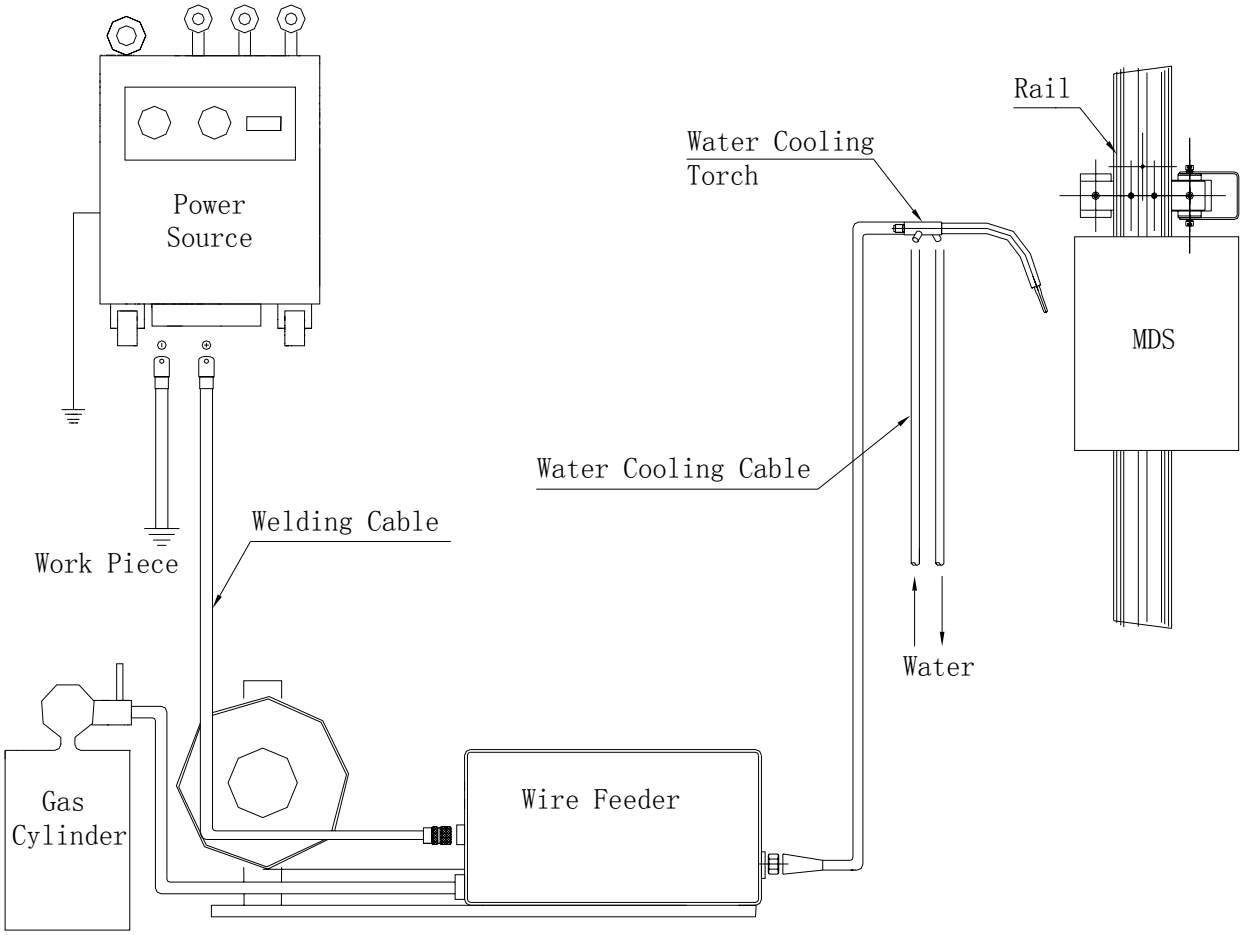
Faults	Causes	Solutions
Electron and control problem		
The illuminating lamp is not on.	The source is not switch on.	Switch on illuminating lamp.
	The illuminating lamp is damaged.	Replace illuminating lamp.
	Relay KA5 becomes loose or is damaged.	Fasten or replace KA5.
The frame cannot walk.	The frequency converter gives an alarm and cut off output.	Reset the frequency converter and check alarm cause.
	Relays KA1 and KA2 become loose or are damaged.	Fasten or replace KA1 and KA2.
	The frequency converter is damaged.	Replace illuminating lamp.
	Switch SA4 is damaged.	Replace the switch.
	Control wire of manual control box fails.	Detect circuit.

The elevating platform cannot run.	The frequency gives an alarm and switches off output.	Reset the frequency converter and check alarm cause.
	The platform has run to the limit switch and touched the limit switch.	Run reversely.
	The frequency converter is damaged.	Replace frequency converter

Warning

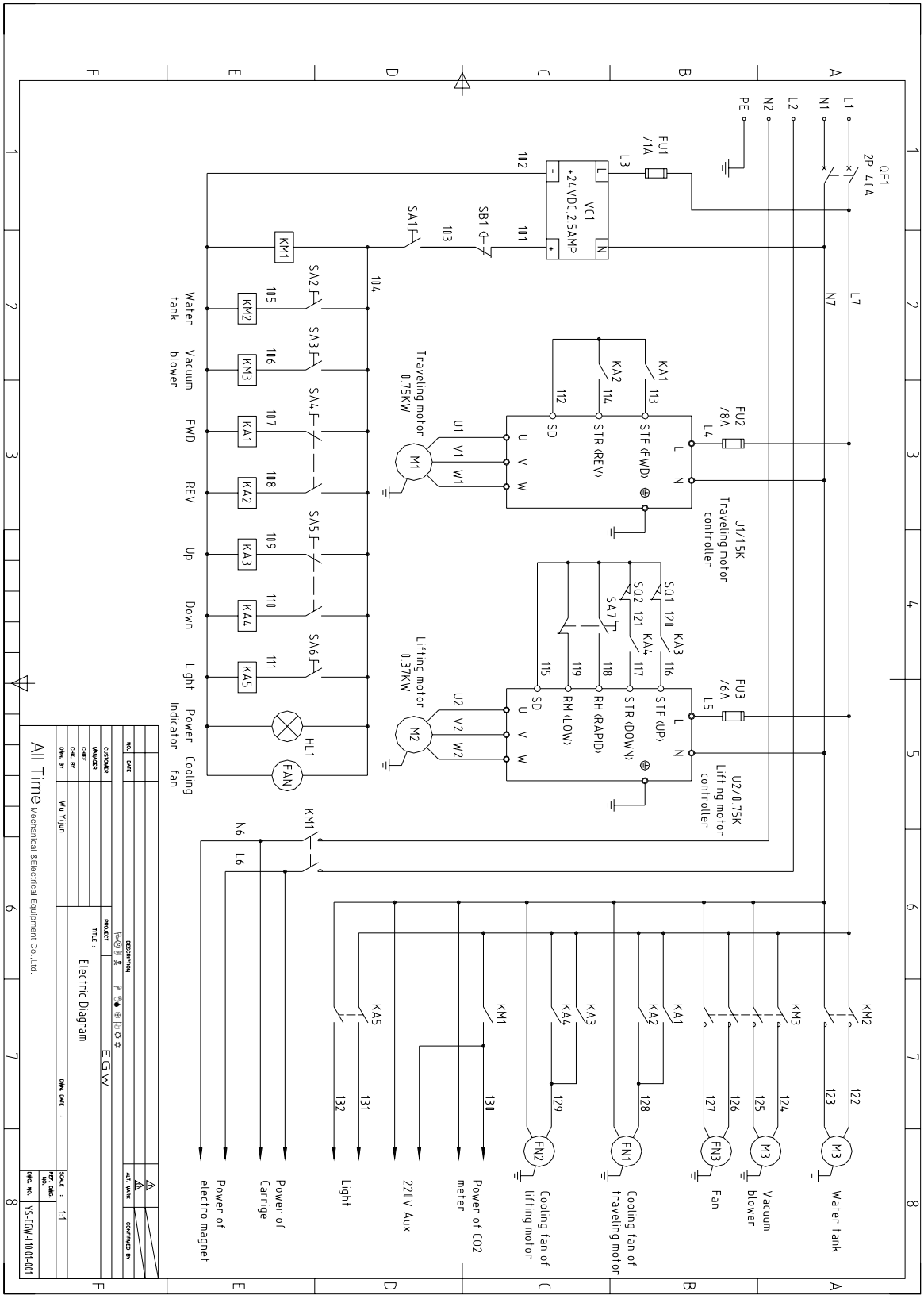
Any questions or whenever you cannot carry out the maintenance or repair, please contact Bug-O at 1-412-331-1776.

7. Welding System Connection Diagram:

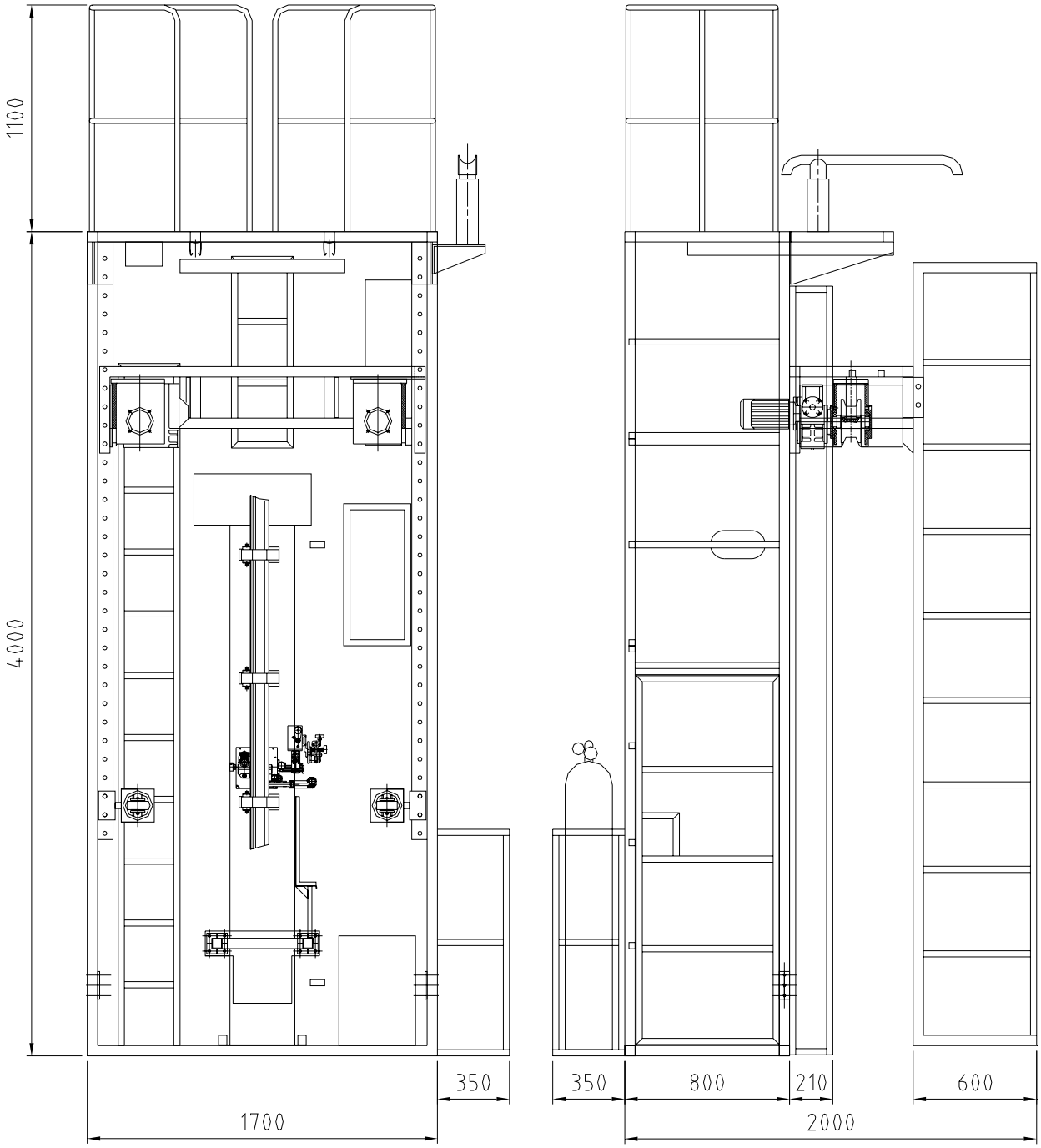


8. Electrical Schematic Diagram

Diagram of Machine Frame Control system：



9. Installation Dimension and Structure Diagram



Dimension diagram of EGW