Model G65S

Operation instructions

Pneumatic Fixed Tube to Tube Sheet Welding Head

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Content

.1. Security Matters

Warning: For your personal safety:

Arc welding is dangerous.

- In order to avoid unnecessary casualties, please protect you and other people's personal safety. Children should stay away from welding site. The operator must wear protective clothing and protective glasses to operate!

Electric shock can wound people

- Before the use of equipment, power and water must be grounded!
- In the welding process, electrode and workpieces' temperature are very high. Please do not touch the hot workpieces with your skin and wet cloth. In order to prevent the damage to your hands, please wear dry gloves during construction!
- Insulate yourself with dry insulating materials from the workpiece and ground, and the area of insulation materials must be large enough!
- During the automatic welding process, the temperature of the electrodes, welding head, welding nozzle and welding torch is very high!
- Ensure that the work cable is contacted well to welded workpiece and be as close as possible to the workpiece's welded spot!
- Workpiece and welded metal needs to be grounded well!
- In a safe mode of operation, please check that the electrode, ground wire clamp, welding cable and welder is intact and replace the damaged device!
- Electrode can not be cooled by water!
- Do not touch the conductive parts connected to the two welding electrodes at the same time!

Arc ray is harmful to human body

- During the welding process, please wear protective glasses to avoid spark and arc ray damage!
- Please wear protective clothing made of flame-retardant materials and make sure that your skin avoids the arc rays damage!

Smoke and dust is harmful to health.

- Smoke and dust produced during welding is harmful to health, avoid inhaling it!
- Protective gas for welding may be inhaled and damage people's health, so welding site must be well ventilated to ensure that the inhaled air is clean!

Welding spark can cause fire hazard

- Move inflammables away from the welding site. Otherwise, cover them with fire-retardant material!
- Remember that welding sparks and heat metal is very easy to splash during welding. Please prepare fire extinguisher around!
- If using compressed air during the welding process, please take corresponding special protective measures!
- When no welding, the electrode do not touch the workpiece to avoid overheating the workpiece!

If gas bottle is damaged, it might cause an explosion

- Use compressed gas cylinders in good condition and install sound control valve. All the air tubes and filters should be sound and suitable!
- Gas cylinders must be installed and fixed!
- There must be enough space when installing gas cylinders to avoid collisions and resulting in physical damage!
- Gas cylinders must be removed from the welding site or other fire sources!
- Prohibit contacting gas cylinders with electrodes, electrode holders, or other electriferous parts!
- When you open the cylinder valve, don’t plumb your head and face in the face of the valve’s outlet!
- Do not remove valve protection cap and the handle, unless the cylinder is in use or ready to be used!

The noise over 70 db can cause permanent harm

- Please wear suitable earmuffs or earplugs!
- Ensure that the noise does not affect other people passing the work areas!

Electromagnetic interference may affect the welder’s normal use

- Welder must have a regular maintenance!

- Wire should be as short as possible and should cling to or contact with the ground!
- The protection of other wires and equipment around can reduce the effects of radiation!

During working, the welder may cause electromagnetic interference to electronic product around

- Make sure to remove the possibly interfered electronic products when welder works!
- If the welder works around computer and susceptibly interfered electronic products, related electronic equipment should be closed first!

Violation of operation process may cause danger

- Make sure to read the instructions carefully before using the equipment!
- Laypeople are prohibited from using the equipment!

Our instructions introduce you the safe use of equipment, which can reduce the occurrence of accidents. So please carefully read the instructions before you use the equipment!

.2. Equipment Details

.2.1 Overview

This machine is a private welding head designed for tube / plate automatic TIG welding. It can be used to a variety of tube / plate automatic welding. It can weld carbon steel, stainless steel and tube / plate joint of other forms, including the flush end connection, stretching fillet connection. Two welding forms of feeding wire and self-melting can be used.

The machine has vector automatic arc length control system. Through collecting the arc voltage signal, the feedback principle automatically correct electric arc voltage, to maintain stable space between the tungsten electrode and welding surface. The function of automatic arc length control can also be turned off. Through the 2 multifunction controller knobs, the space between the tungsten electrode and welding surface can be manually intervened to meet the needs under different conditions.

The welder adopts fast install and remove modular design, which is easy to maintain and install. It has dual-loop water cooling system and long sustained working hours. The perfect gas protection system ensures a good protection of weld puddle during the whole process of welding.

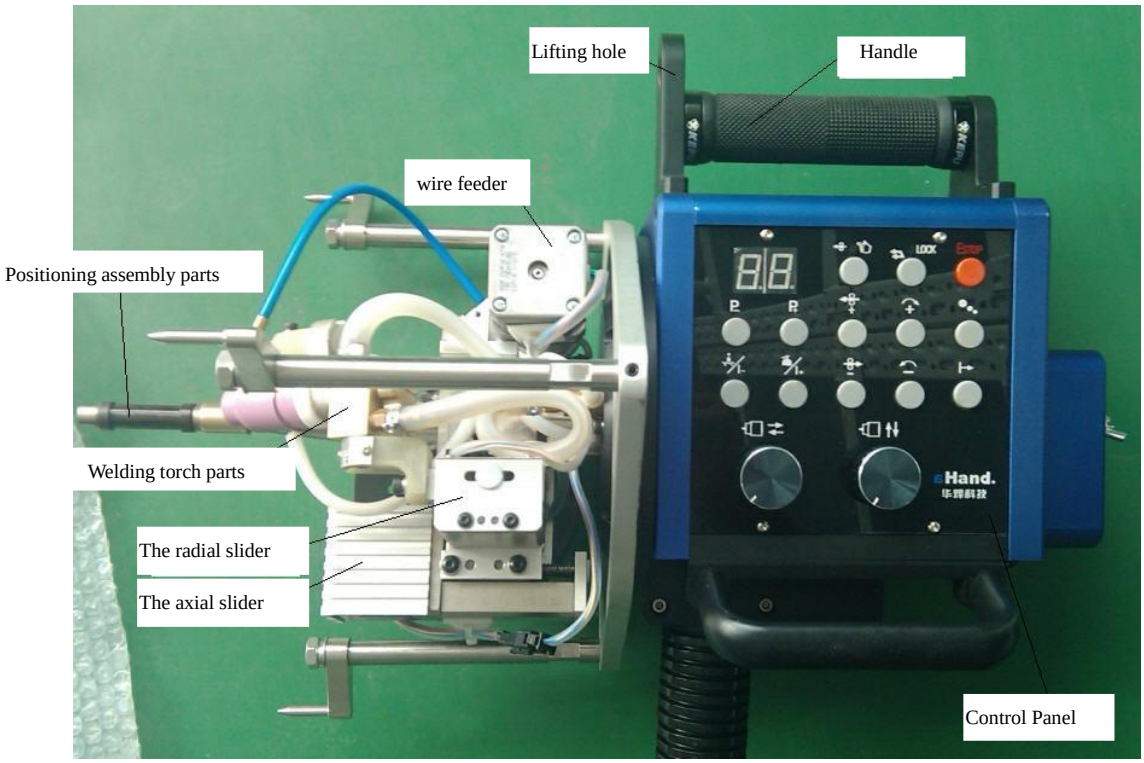
The welder's movement is adjusted by dual-mode of pulse and constant speed, which greatly increases the depth of fusion, effectively improves the welding efficiency, makes weld lines appearance uniform and beautiful, and need no grinding or cleaning. The welder adopts high load rate design and sustained working hour is long. Under the guarantee of a good process, the repair rate is very low. The welder can greatly improve the process repeated welding. Also the welder has good control power matching, can precisely achieve all position TIG tube / plate welding and achieve the desired welding effect.

.2.2. Technical Parameters

Items	Technical parameters
Tube Plate connection form	Tube is flat as the sheet, tube protrude (minimum tube bridge 5mm, maximum length of stick out 4mm)
Power source	PC508 digital automatic welding power source
Rotary speed of welding torch	0.15—5.58RPM
Range of axial displacement	18mm
Range of radial displacement	30mm
Rotation angle of welding torch	0 º~30 º

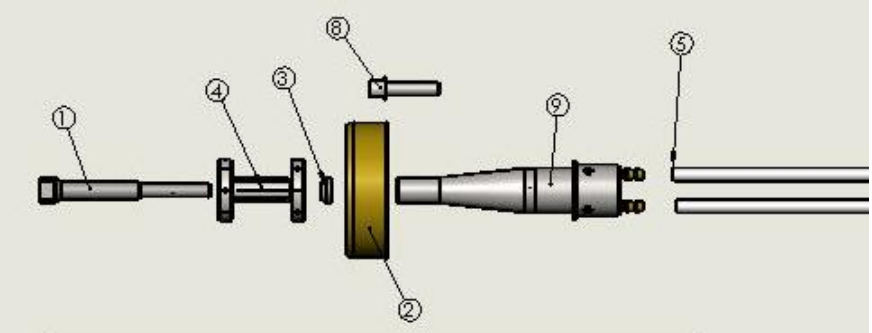
Maximum welding current	230A (Duty cycle 60%)
Welder head code	84(Rotation), 114(wire feed), 30(AVC and OCS)
Maximum wire feeding speed	2000mm/min
Diameter of wire	0.8mm/1.0mm(Optional)
Protection gas	Ar
Cooling	Water cooling
Diameter of welding tube	From 14mm(ID) to 60mm（OD）
weight	≈18kg
Dimensions	455×195×237mm
Application	Boiler, chemical industry, heat changer, air conditioning, nuclear, thermal power etc.

.2.3 Components and Operation



.2.3.1 Positioning Assembly Parts

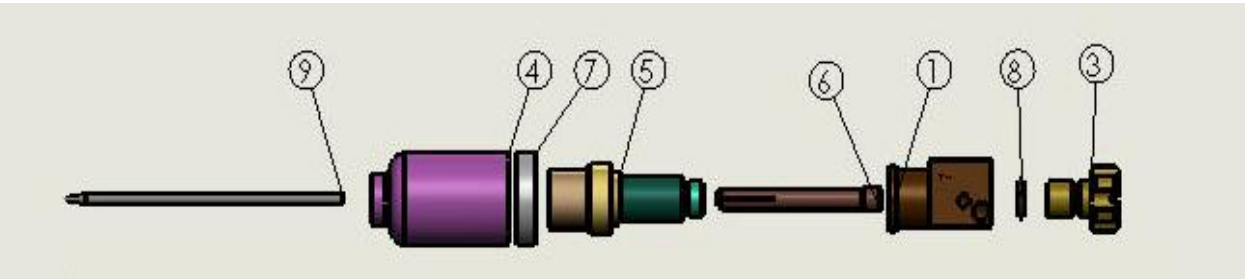
●G65S positioning assembly parts is composed of the right positioning assembly (copper tubing; “O”seal ring 18×1.8; positioning seat; passing tube; 3-M3 × 6, etc.), the left optional interchangeable assembly (nuts; positioning core head; core rod).



No.	Code	Description	Quantity
1	37013-8A	D8 core expender adjustable fixer	1
2	9508-64A	Cooling core	1
3	9504-8A	D8 conical head	1
4	9505-30B	D8 core expender	1
5	9332-0.45A	D6x1.5 silicone water hose	2
8	37014	Lock head	1
9	G37004A	Water cooling mandrel	1

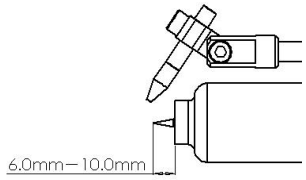
2.3.2 Welding torch nozzle assembly

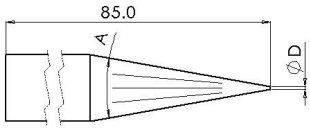
No.	Code	Description	Quantity
1	36008A	Welding torch head	1
3	36009A	Back cap	1
4	9400L	6# Ceramic nozzle (54N16)	1
5	9401A	Connector and gas distributer	1
6	9402A	Tungsten electrode clamp	1
7	9403G	Gas seal	1
8	GB-T 3452.1 G6.7x1.8	“O” ring	1
9	D2.4 tungsten	Tungsten electrode	1

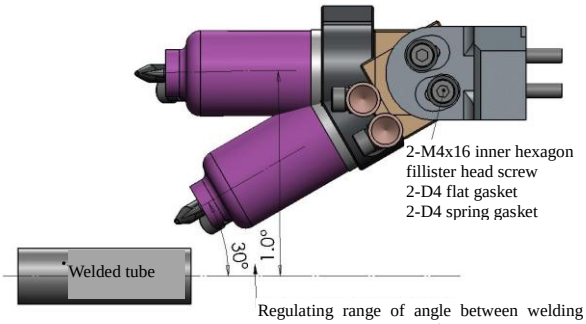


●Installation of tungsten electrode and accessory selection (see above figure for the number corresponding to name)

▲The installation process of tungsten electrode is as follows: join the 7 step surface with 1; tighten 8 (with a matching model requirement); tighten 6 (with a matching model requirement); insert ground 4(diameter decided by welding process and working conditions) into 5 (with a matching model requirement); align the right end chamfered surface of 5 with the left chamfered surface of 9 (no deviation); screw installed 10 and 9 into 1 (before installation "O" seal ring check whether there is defect), then folder 5 lock 4 through inside cone of 8, the distance from the installed tungsten electrode's front-end to ceramic nozzle should be 6-10mm (as shown), see the technological parameter table behind for the values' choice.



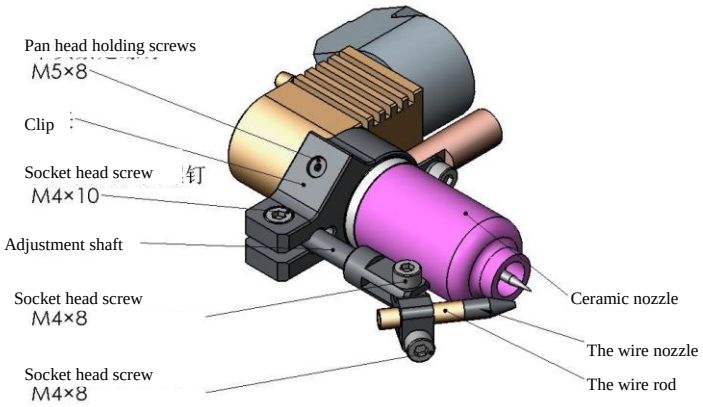




▲Tungsten electrode's grinding requirements

1: the diameter D of discharge tipped platform is 0.2~0.8mm according to different welding current (see process table), equally, see process table for the taper A.

2:Grinding marks on the cone is required to array in radial order as shown.



3:G65S allows the tungsten electrode's maximum cut-off length of 85mm, so the purchased tungsten electrode of standard length of 150mm can cut off 2 (75mm each), maximumly reduce the loss of tungsten electrode cut-off.

● Adjustment of welding torch head's obliquity

Loosen two M4 ×16 screws, we can make welding torch head's axis and the axis of welded tube of 1~30 degrees angle. In principle, it can achieve making welding torch head's axis and the axis of welded tube parallel and achieve vertical welding of weld plate. The angle of 1~30 degrees is defined as angle adjustment range here. Refer to the table of processing technical for the angle value of specific welding process values.

●Position adjustment of the wire nozzle

▲Releasing the flat head setting screw M5 ×8 can make the whole wire feeding joints rotate around the ceramic nozzle axis through the insulation clip, to adjust the deflection angle of wire into the weld crater. That is generally only used in the first coarse adjustment. The product is adjusted well when out of the factory.

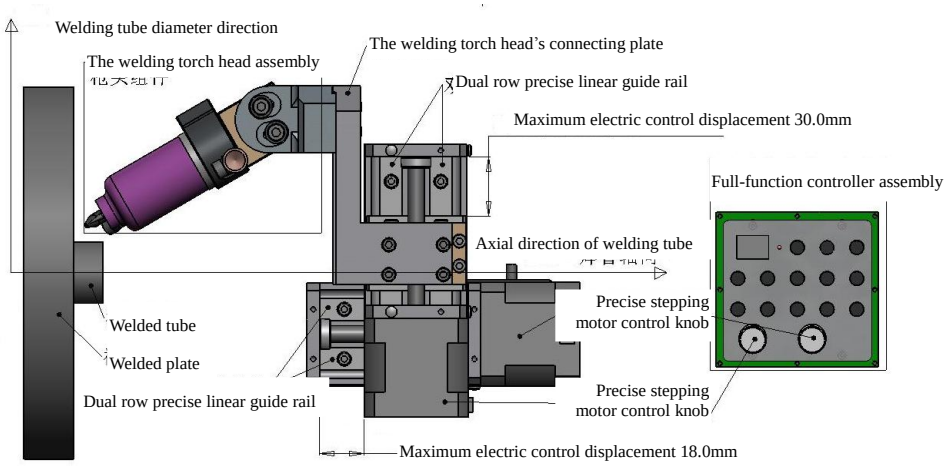
▲Releasing M4 × 10 inner hexagon fillister head screw can adjust the shaft to do fore-and-aft displacement adjustment. The adjustment shaft has been done non-skid treatment. So you need not tighten the screws with too much preload to avoid the clip's crack.

▲Loosen the inner hexagon fillister head screw M4 ×8 of adjustment shaft, you can adjust the angle between output wire rod and the ceramic nozzle axis (that is the angle between tungsten electrode's axis and the wire axis, Refer to the table of processing technical for the angle value)

▲Release the M4 ×8 inner hexagon fillister head screw of the lower part of the figure; you can adjust the distance between the wire nozzle and the weld crater.

.2.3.3 Multifunction attitude adjusting assembly

●The assembly uses the combination of two sets of modularized single-axis numerical control linear movement mechanisms. Each set of mechanism adopts dual row precise linear guideway for movement guiding, is driven by precise stepper motor, which greatly improves the stability and rigidity of movement. The dual guideway with the stainless steel guard can greatly improve the service life of the assembly.



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●The assembly can work in 2 different modes through the numerical control setting:

▲During the adjustment phase of the welding torch head before welding, the assembly can trim tungsten electrode's position relative to welded part through the corresponding knob of full-function controller assembly. (on the promise that the angle of welding torch head and the stretching length of tungsten electrode have been adjusted well.)

Compared to the previous models' adjustment of the mode of the welding radius, G85E has been greatly improved in adjustment. The old caliber and the current caliber in the market achieves the adjustment of welding radius by mechanical bolt or screw and the abuses are that the slip block gap gradually increases and results in short service life. Although some caliber

has set locking screw after adjustment, it is bad to the simplified operation. The welder can achieve coarse adjustment of the welding torch head's position of 10mm on the welding torch head's connecting plate through two M4 × 16 inner hexagon fillister head screw. With the Y-axis' 30mm large displacement adjustment, it can of the radius can achieve a wide range of welding radius adjustment.

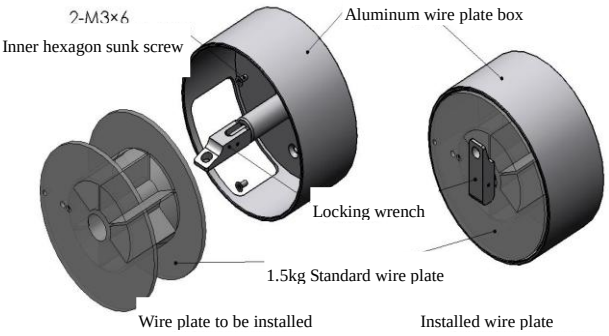
The relative position of the tungsten electrode tipped end and the welded parts can be manually intervened during the welding process. In the state that you don't open the arc tracking (the welded parts is of poor working conditions, the size is discrete, and the shape is irregular etc.), facilitate to adjust and response quickly.

▲The welder adopts a vector arc length tracking technology. By detecting the arc voltage between tungsten electrode and weldment, the CPU controls the X, Y-axis displacement respectively. Through the pre-set displacement ratio, the axis of tungsten electrode and the axis of welded tube can form an angle and automatically adjust the discharge distance to prevent the "crawl tube" phenomenon caused by the pure X direction arc tracking model.

.2.3.4 Dual size wire feeding output assembly

●Integrated wire plate's installation

Pull the lock wrench straightly like the left figure, after wire plate to be installed is inserted into the wire plate shaft; you can pull the lock wrench levelly, as shown on the right figure. The disassembly is just the inverse operation.

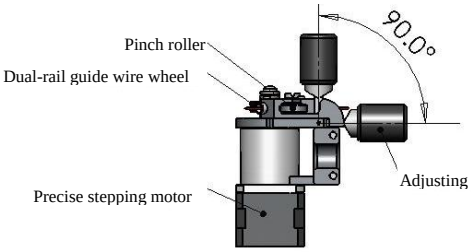


●Wire feeder's operation and adjustment

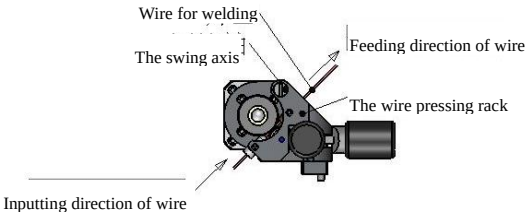
▲ Instruction of main parts' function:

Adjust handle (compress or release the wire pressing racks, adjust the pressing by its scale)

Dual-rail guide wire wheel (it has 0.8 and 1.0 of the guide wire slot. For wire of different diameter, as long as twist off a screw of the top, manually pull it out, and install reversely)



▲ wire's loading: handle up the hand knob 90 degrees (as shown in top figure), pressure wire wheel will swing to the right at a certain angle round the swing axis (as shown in bottom figure), thread the wire loaded into the wire plate box into the wire nozzle, then send the wire from the wire nozzle into the back wire feeding tube (the loading direction as shown in the bottom figure), and then adjust the hand knob back to horizontal position, appropriately adjust the pressure. Press the corresponding button of the full-function controller assembly, the wire will be automatically sent out of the final wire nozzle by stepper motor. If the wire can not be properly sent out of the wire nozzle, this is because of a big knuckle within a short distance. If no failure, Unscrew the wire nozzle of the front wire rod, then after the wire is sent out, screw the wire nozzle.



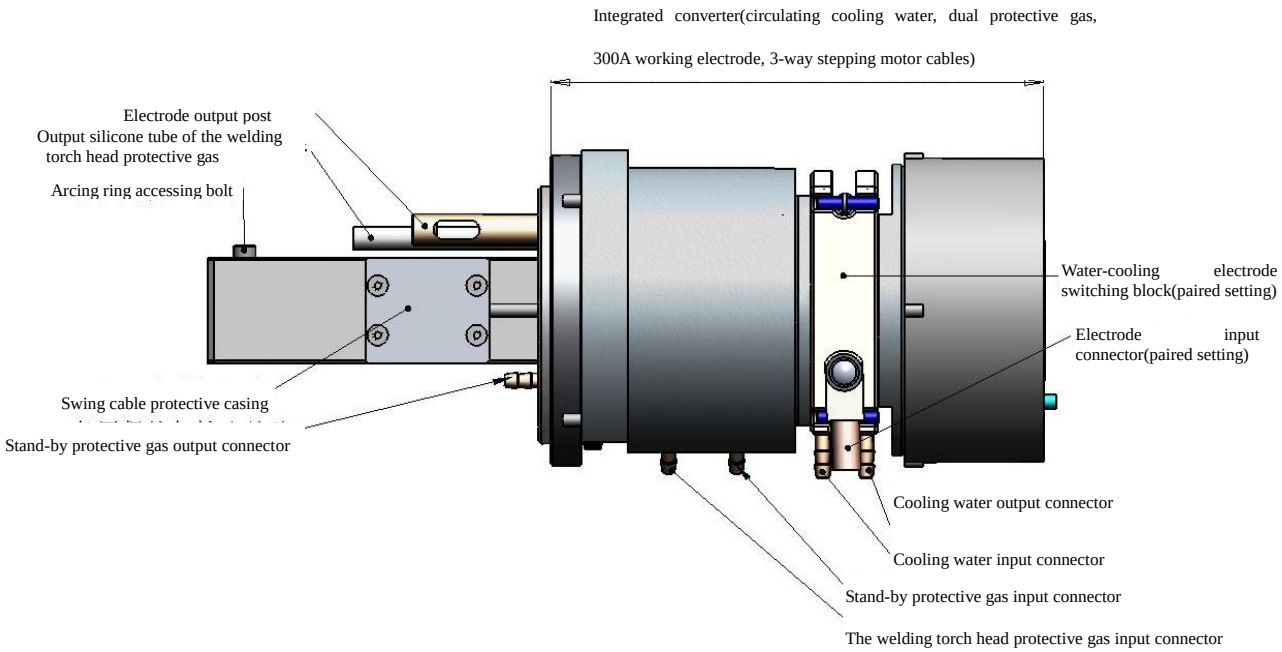
2.3.5 Full-function airborne controller assembly

G65S is equipped with a full-function controller to replace the remote controller of

old model, which reduces the sense drag of multi-functional accessories, and reduces the incidence of failure, and is very convenient for the operator. The functional key's functions are described as follows:

No.	Icon	Function name	Function description
1	**88**	LED display screen	Display present procedure code(00…99).
2		Wire feeding mode	Manual feeding(left LED light always bright)/ automatic feeding(left LED light is out)
3		emergency stop	If experience a state of emergency, shut off the main power.
4		Reverse feeding	When wire feeding mode is manual, manually adjust the wire's output position. When wire feeding mode is automatic, increase or decrease the wire feeding speed.
5		Forward feeding	
6		Decay stop	Turn off function and stop the welder according to the system's pre-set sequence
7		Test of gas/current＋	Test protective gas (or cooling water) before start welding, when start welding, increase or decrease welding current.
8		Test of water/current －	
9		Strat welding	After all the preparation work, implement automatic welding process.
10		Engine head positive rotation	Manually control head's swing, carry out forward / reverse operation, observe whether the head is of normal operationor adjust the head.
11		Engine head reverse rotation	
12		Procedure increase	Execute the work of procedure code's increase or decrease.
13		Procedure decrease	
14		Radial adjustment	Control attitude adjustor's Y-axis movement
15		Axial adjustment	Control attitude adjustor's X-axis movement

2.3.6 Conversion interface core assembly



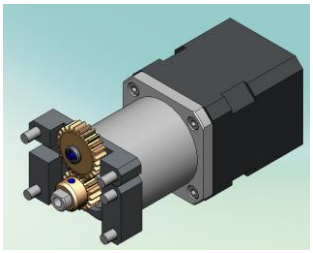
This assembly consists of an integrated converter and a front rotary output interface, completes the 300A main electrode; circulating cooling water; dual protective gas; 3-way 12-core stepper motor control cables, from relatively fixation to no wound involution states switching. Locations of all interfaces are shown above.

Important Notice

The assembly integrated transducer is composed of high precise parts. The handling and redeployment needs professionals. So the business or individual who purchases the product is prohibited to disassemble and reform the welder, and the company will have the right to refuse to provide services of solving the failures of the resulting leakage of air and water, ignition etc. Please contact the company when the welder breaks down. The company will send people for maintenance as soon as possible.

2.3.7 Rotary Drive Assembly

It adopts a special precise stepper motor combined of special precision reducer, which runs smoothly and the torque is high; drive rotary motion is of high precision. According to the customer's specific required speed, shift configuration can be provided.



2.3.8 Lag gas protection assembly (optionally purchased assembly)

To protect easily oxidized weld pipe fittings (titanium, etc.), the welder is equipped with a delayed gas protection mechanism.

3 .Operation of Equipment

3.1 Preparation before Welding

3.1.1 Prepare the following parts or welding materials;

a. Core rod locator matched with the internal diameter of the pipe

b. The corresponding workpiece's welding wire (0.8)

c. Tungsten electrode (common use 2.4)

d. Compressed air (bottled gas may be temporarily used when equipped with decrement gauge);

e. Argon.

3.1.2 Essential tools:

a. One inner hexagon spanner of M3; M4; M5 respectively;

b. A diagonal cutting pliers;

3.1.3 Check the water in the tank is adequate; otherwise, make up the amount of coolant;

3.1.4 Connect tube and welding cable of water, electric and gas related to welding torch head, power and water tank.

3.1.5 Install earth wire clamp.

3.2 Adjusting Welding Torch

Select the appropriate core rod locator and install it to the core rod according to the diameter of the workpiece;

Loosen the lock head's pin roll screw, rotate the head, adjust the required angle of welding, and then lock pin roll;

Install wire plate in the wire box;

Screw the wire feeding hose into the wire feeding output tube, and the other end of hose is connected to wire feeder;

Install the wire feeding wheel appropriate to wire diameter, and adjust the tight hand knob;

Thread the welding wire into the fast-assembly lead hole, start and press the feeding button on the remote controller until the wire is sent to wire nozzle. (If directly thread the wire, pay attention to rounding the wire end to avoid damage to the wire feeding tube's inside wall)

Install arcing ring;

Adjust the arc length;

Switch the welding torch to the starting position;

Cut the stretching wire to 5mm to feeding nozzle.

3.3 Starting Up

Turn on the power, operate the controller, check whether the rotation, wire feeding, arc length control is normal or not. (Refer to power instructions for the remote controller's operation)

Check whether the coolant flow is normal.

3.4 Setting Welding Parameter

Please refer to the power instructions for setting welding parameters.

3.5 Starting Welding

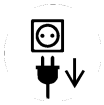
Before the first welding starting, welding simulation must be done to observe that whether the torch is in good condition and protective gas is normal. If everything goes well, ignite and start arc.

4 Maintenance

Under normal using circumstance, the welder can be used at will and only needs minimum maintenance. However, to ensure correctness during the welding process, some issues must be paid attention to, which includes regular cleaning and inspection. Of course, as described below, it depends on the amount of pollutants in the surrounding environment and the welder's using hours.

The cleaning, inspection and maintenance of the welder must all be carried out by professionals. If you do not follow the requirements of operation and result in failures, please don't operate the welder again until the error is corrected.

4.1 Cleaning



Before cleaning, make sure that he welding power is away from the electric fence. **Pull out the power plug!**

(Cut or remove the fuse does not guarantee absolute insulation) pull out all the connecting plugs of the welder head to power.

Welder head should be operated as follows:

- If there is much dust, clean with dry compressed air.
- The outer surface of welder head should be wiped with a piece of dry cloth.
- The attached dirt of electrodes, welding torch head and other parts can be cleaned after sand papering.

4.2 Maintenance

- Cooling system

Regularly check the cooling system of the head to ensure that there is no leakage under the pressure of 0.5mpa and check it every month to ensure that the normal flow is no less than 450ml/min. The proposed replacement of the coolant is once every quarter and distilled water or deionized pure water if available can be used to replace the ordinary coolant. In cold district the coolant should be added a certain amount of alcohol (concentration 75%) in winter.

- Rotary system

  Rotation system should be kept in smooth operation state, no abnormal sound in rotating. Regularly clean dirt produced by wear between the two bearings and gear inside the head, and adds an appropriate amount of molybdenum disulphide grease yearly.

- Arc length control device

  Under normal circumstances, arc tracking control is sensitive. When manually operate the device, you should feel relaxed and easy, but there should be no beating gap. To ensure the above state, maintenance must be conducted every quarter, clean arc length control screw rod and slider rod and add molybdenum disulphide grease.

- Welding torch and cable assembly

  Keep the tungsten electrode, ceramic nozzles and current divider clean, and ensure welding torch head's good airtight and watertight. Woven wire inside the water and electricity pipe should be no breakage and contact well. Tungsten electrode holds tightly and conducts well.

- Wire feeding system

  Wire feeder's wire wheel, roller should be kept clean. The entire wire feeding system must be cleaned when install wire every time. And clean and maintain the wire feeder weekly. When wire feeding nozzle is obviously worn, it must be replaced. Wire feeding tube must be kept smooth. The gears and bearings inside the wire feeder must be cleaned every year, and add an appropriate amount of molybdenum disulphide grease to ensure the whole feeding system's smooth.

4.3. Repair

☞ Maintenance must be carried out by professionals.

All system failures are generally resolved by the equipment supplier.

The only way of the return of equipment with failure on deliver is through the dealer.

When replace parts, please use the original accessories.

When order accessories, you must clearly write the welding machine's model, serial number and required quantities. You'd better describe the accessories' body clearly.

If the equipment's repair and maintenance is carried out by non-professionals, require them to act in accordance with the above considerations.

5. Reference Parameters

Our company have many years' experience of welding carbon steel tube sheet, and we also recorded a number of process parameters which have been verified, modified and summarized below for reference in the process of operation. For there are still some uncertain factors, the customer should make some adjustments in the process of operation according to the specific circumstances.

Typical welded tube(external diameter×wall thickness)			16×2	19×2	25×2	32×3	38×3	45×3	51×3	57×3
welds prepares	1	Tube stretching(mm)	2.5-4	3-4	3.5-4	4-6	5-8	5-8	6-9	5-9
	2	Tube bridge(mm)	≥4		≥5		≥6			
	3	Welding wire's diameter(mm)	0.8		1					
	4	Protective gas flow(L/min)	8		10					
	5	Tungsten electrode's diameter(mm)	ϕ2.4			ϕ3.2				
	6	Stretching length(mm)	10							
	7	Tungsten electrode's height(mm)	2		2.5					
	8	Ceramic nozzle ode(#)	6	6/8	8					
	9	Tungsten electrode's taper angle	20					30		
	10	Tungsten electrode's platform height(mm)	0.2-0.4	0.2-0.4	0.3-0.6	0.4-0.6	0.4-0.6	0.5-0.8	0.5-0.8	0.5-0.8
	11	Welding torch angle(°)	20							
Main parameters setting of single coil welding	1	Pre-ventilation(s)	3							
	2	Lag gas (s)	3	5	8					
	3	Premelting time(s)	2							
	4	Premelting current(A)	90	100		160A	180			
	5	Running angle(°)	368							
	6	peak time(ms)	150	180	200	250	250	250	300	300
	7	Peak current(A)	135	135	170	245	255	255	265	260
	8	Background time(ms)	150	180	200	250	250	250	300	300
	9	Background current(A)	50	55	50	60	75	75	80	80
	10	decay time(s)	4							
	11	Welding speed(mm/min)	86	93	99	97	88	84	77	73
	12	Feeding start(°)	1							
	13	Wire feeding speed(mm/min)	310	490	600	800	900			
	14	Stop feeding angle(°)	360							
	15	back suction time(s)	0.4							
Two continuous welding; Main parameters between 0~360	1	Peak time(ms)			200	250	250	250	300	300
	2	peak current(A)			170	230	245	245	255	255
	3	Background time(ms)			200	250	250	250	300	300
	4	Background current(A)			50	60	75	75	80	80
	5	Welding speed(mm/min)			99	97	88	88	77	73
	6	Wire feeding speed(mm/min)			300	250	250	250	250	250
Two continuous welding; Main parameters between 360~720	1	Peak time(ms)			200	250	250	255	300	300
	2	peak current(A)			170	245	255	255	265	265
	3	Background time(ms)			200	250	250	250	300	300
	4	Background current(A)			50	60	75	75	80	80
	5	Welding speed(mm/min)			99	97	99	99	77	73
	6	Wire feeding speed(mm/min)			400	800	900	900	900	900

Note: If there is groove of 45 °×2 in the tube plate, the user can ues continuous two welding procedures of different partition section with the welding angle set at 730 °, while the first section is 0~360 °and the second section is 360~720 °.

6. Acknowledgements!

Thank you for choosing the products of A-Hand Technology, and thank you for your support! If you have any needs, please call our service hotline.

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