

① Introduction


MZ-ZK Automatic submerged arc welding machine, composed of the tractor and power source, can be used for welding seams of lap, butt and fillet of different medium and thick plates of carbon, low alloy, stainless and heat resistant steels.

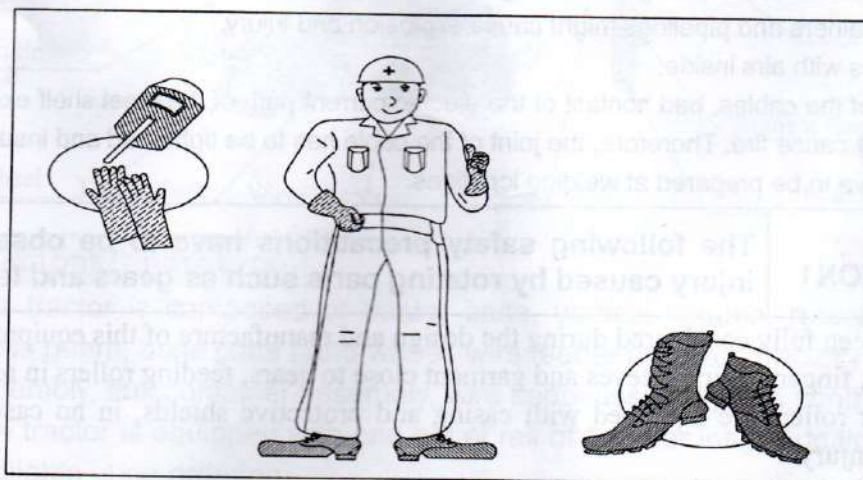
The tractor is developed by absorbing the merits of SAW tractor used both at home and abroad. It features new style, light weight, reliable function and user friendly after our continuous modification and improvement in recent years.

Characteristic:

- The tractor travels steadily and has a wider welding range for wires from $\Phi 2.0$ to $\Phi 6.0$ diameters.
- Easy and flexible regulation. Integrated up and down, rotation of the tractor head with the torch bar.
- Rotatable and height adjustable cross beam
- Easy adjustable flux container.
- Double driven wire feeding with straightening mechanism, stable wire feeding, good centering, strong drawing force and low dissipation power.

② Safety precautions

 Warning	<p>Electric shock can kill! Protect yourself by putting on insulated glove, safety boots and other protective gears before operation.</p> <p>Keeping children away from working area.</p>
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ELECTIC SHOCK can kill ! Protect yourself and others from possible serious injury or death.

Although safety factors have been fully considered during the design and manufacture of this SAW tractor, the safety operating regulations have to be observed during implementation:

- Do not wear wet clothes or glove during welding since welding wire, feeder roller and torch are with electricity, and in no case those parts should be touched.
- Check carefully the connection between the welding cable and the power source, replacing those broken parts for insulation purpose immediately.
- In case the working environment is humid or the operation has to be operated on steel plates or steel stands, RCD(residue current protective device) should be installed.
- The power has to be cut off before connecting the SAW tractor with the power source or performing repair jobs.
- Do not use cables without enough current carry capacity, or ones that are not intact on surface or inside conductors shown already.
- The joint of the cables must be clamped tightly and insulated.
- All the power has to be cut off when the tractor is not in use.



FUMES AND GASES can be dangerous, please wearar protective gadgets

Welding may produce fumes and gases hazardous to health. To avoid poisoning and suffocation, use enough ventilation and air breathing apparatus.

- Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. Toxic gas and other irritating products will be generated when welding at these locations.
- Harmful fumes and gases maybe produced when welding coated steel plates, keep enough ventilation and protective gadgets must be used.



Pay attention to following instructions to avoid fire, explosion and breakage.

- Remove fire hazards from the welding area.
- Keep the works just finished welding from fire hazards.
- When there are hidden flammable objects near the welding area, move away those hidden flammable objects or cover them with inflammables.
- By starting arc on fire hazards such as gasoline might cause explosion.
- Welding sealed containers and pipelines might cause explosion and injury.
- Do not weld pipelines with airs inside.
- If improper contact of the cables, bad contact of the electric current path of the steel shelf exist, hot caused by electric current may cause fire. Therefore, the joint of the cable has to be tightened and insulated.
- Fire extinguishers have to be prepared at welding locations.



CAUTION !

The following safety precautions have to be observed to avoid injury caused by rotating parts such as gears and feeding rollers

- Safety factor has been fully considered during the design and manufacture of this equipment, however, do not put your hands, fingers, hairs, sleeves and garment close to gears, feeding rollers in rotation.
- Gears, wire feeder rollers are equipped with casing and protective shields, in no case they should be removed to avoid injury.
- Do not put on gloves when guiding the wires and changing the wire spool.
- Be sure that all checking, operation, maintenance and repair procedures performed only by qualified individuals.

For safety reasons, please pay special attention to the safety precautions as described and classified accordingly to their seriousness as below,



Warning

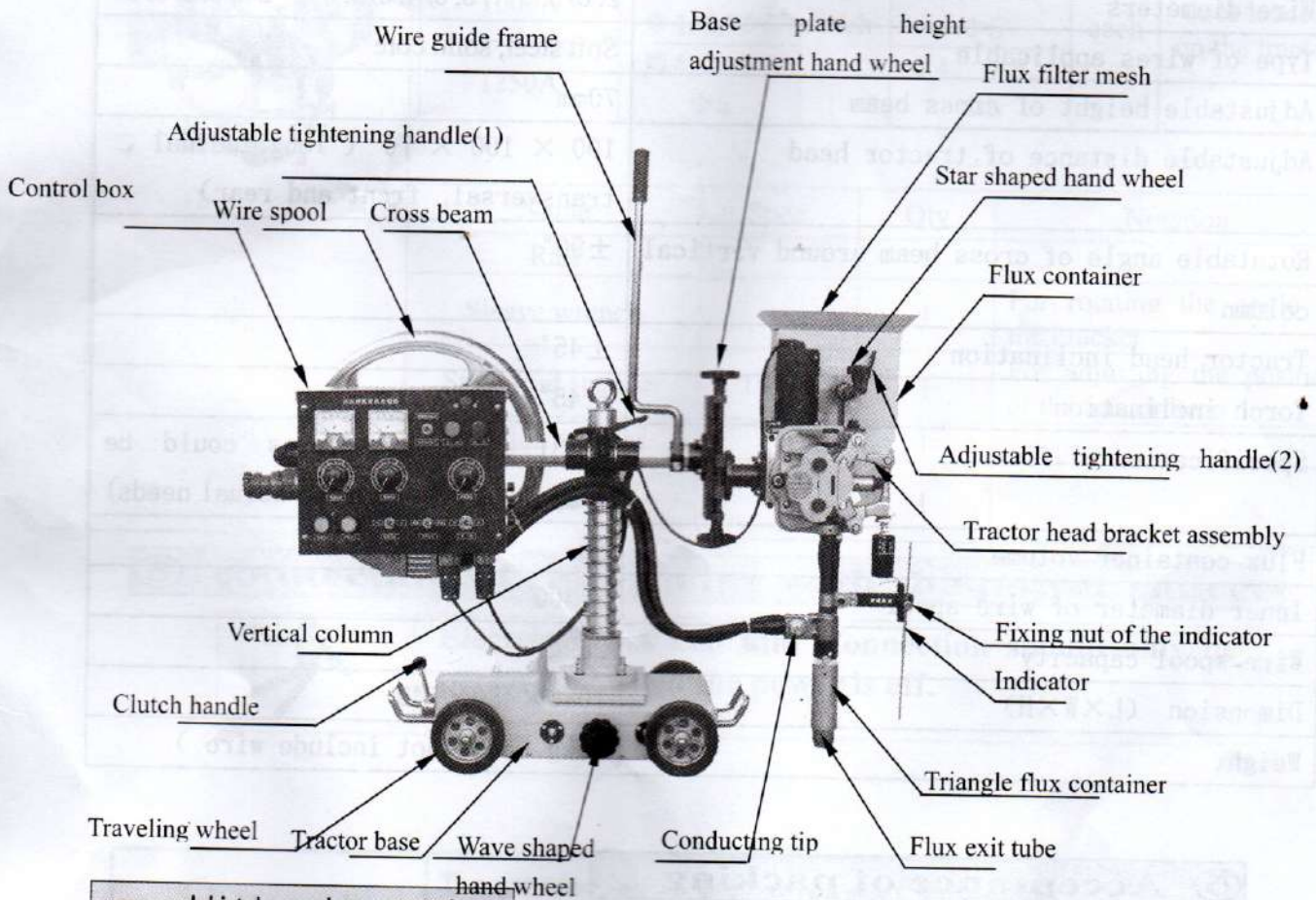
This declaration means that the safety precautions have to be observed strictly to avoid serious injury or death.



Attention

This declaration means that the safety precautions have to be observed to avoid slight injury or machine damage.

③ Component list of the MZ-ZK tractor



■ additional notation

- ▲ The tractor is composed of tractor base, vertical column, rotary part of the cross beam, base plate hand wheel, wire feeder reductor, tractor head bracket assembly, flux container assembly, wire spool assembly and control box
- ▲ The tractor is equipped with one set of rail of 1 meter long. Additional sets are available upon ordering
- ▲ The standard color of the tractor is silver gray with matt finish, alternative colors are available on order.

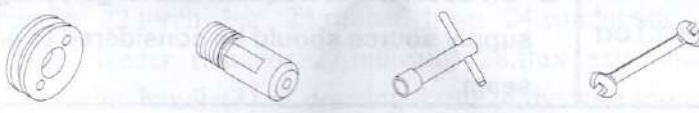
④ Main technical parameters

Items	Specification
Rated input voltage of traveling mechanism	DC110V
Rated input current of traveling mechanism	0.4A
Rated input voltage of wire feeding mechanism	DC110V
Rated input current of wire feeding mechanism	1A
Type of wire feeding	Continuous wire feeding
Welding speed	0.2~2.2m/min 0.2~1.5m/min
Wire feeding speed	0.3~3.0m/min
Rated power source	630A 1000A 1250A
Wire diameters	2.0/3.0 3.0/4.0/5.0 4.0/5.0/6.0
Type of wires applicable	Soft steel, solid core
Adjustable height of cross beam	70mm
Adjustable distance of tractor head	100 × 100 × 70 (longitudinal 、 transversal, front and rear)
Rotatable angle of cross beam around vertical column	±90°
Tractor head inclination	±45°
Torch inclination	±45°
Specification of flux	HJ431 (other fluxes could be applied depending on actual needs)
Flux container volume	6L
Inner diameter of wire spool	φ 300
Wire spool capacity	25kg
Dimension (L×W×H)	1080×480×740
Weight	55kg (does not include wire)

⑤ Acceptance of packing

- The standard packing of the tractor is Styrofoam with corrugated carton, please check whether the package is intact after receipt.
- The right of claim is transferred to the buyers when the tractor was shipped and signed by the carrier. In case a claim should be lodged for transportation reasons, buyers should launch the claim against the carrier when the tractor is received.
- Please open the package for checking and acceptance after receipt of the tractor, the specification and quantity of the tractor and the accessory is as below, please refer to list of parts of MZ-ZK SAW tractor.

List of parts of MZ-ZK SAW tractor

MZ-ZK SAW tractor		Standard accessory			
					
Note: the right size combination of wire feeder roller and contact tip is as below,					
Specification	Feeder roller	Qty	Contact tip	Qty	Note
630A	Φ2 Φ3/Φ4	2 each	Φ2、Φ3	1 each	Including the ones loaded on the tractor
1000A	Φ3/Φ4 Φ4.2/Φ5		Φ3、Φ4、 Φ5		
1250A	Φ4.2/Φ5 Φ6		Φ4、Φ5、 Φ6		
Name	Spec.	Qty	Notation		
Rail		1			
Sleeve wrench		1	For rotating the angle of the bracket		
Stud dead spanner	14x17	1	For adjusting the position of the tractor head		
Instruction manual		1			
Qualification tag		1			

⑥ connection of the tractor with the power source



Electric shock can kill! Connection should only be performed when the power is off.



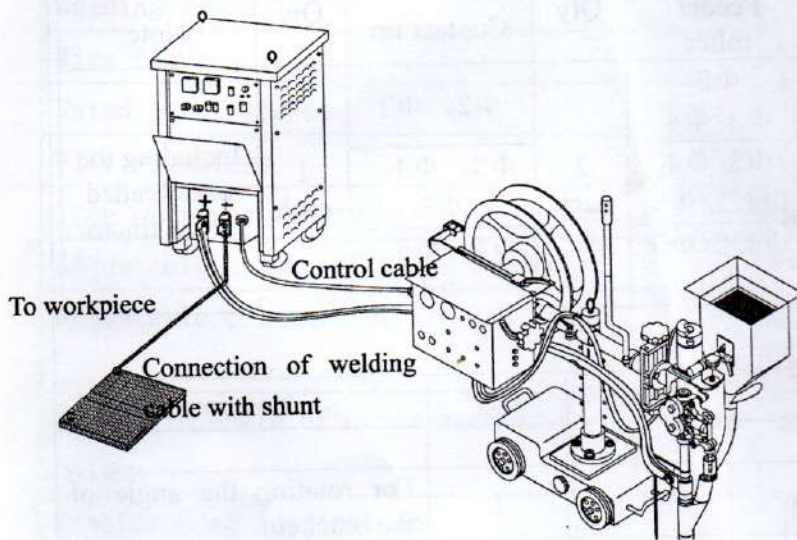
Attention

The connection of the cables must be tightly clamped

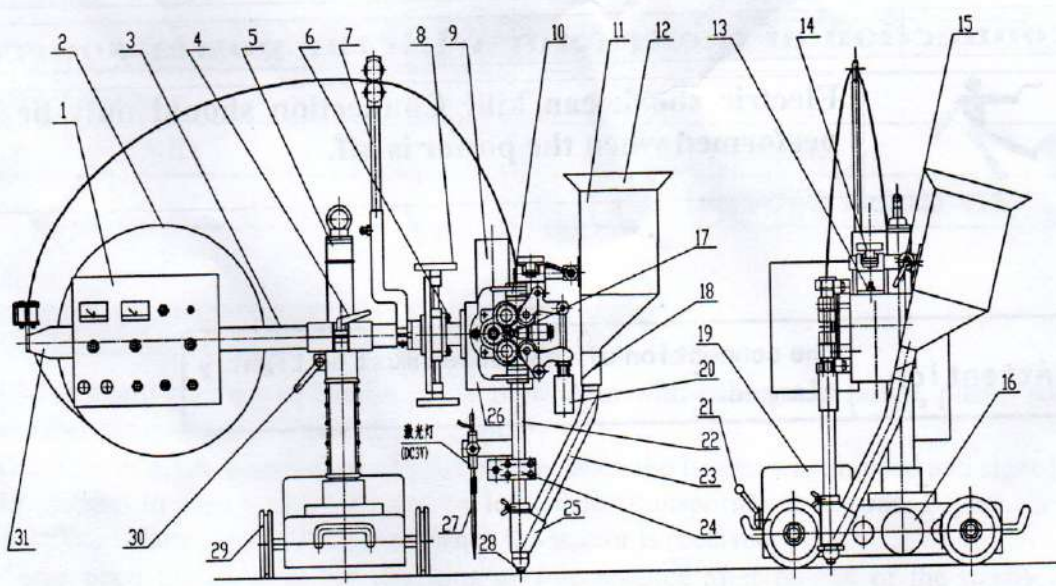


Attention

- Please connect the tractor with the power source of the right specification, misconnection will result in none-performance and even machine damage
- On occasion of frequent and large voltage supply vibration, special supply source should be considered to ensure the quality of the weld seam.



⑦ construction of the tricycle tractor and function of various components

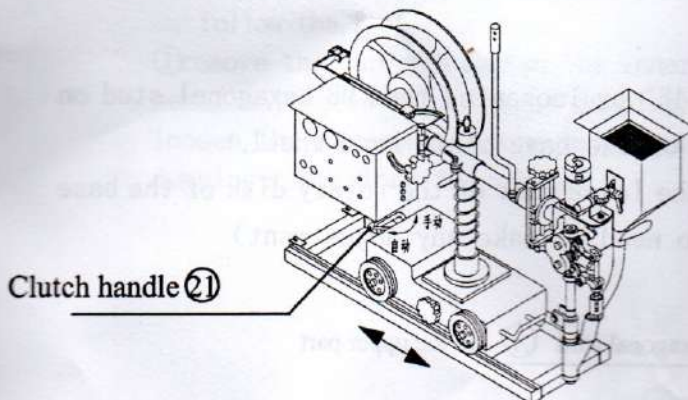



1. control box 2.wire spool 3.cross beam 4.adjustable tightening handle(1) 5.vertical column
- 6.M8 Hexagonal stud 7.wire guide frame 8.base plate height adjustment hand wheel 9.wire feeding motor 10.tractor head bracket assembly 11.flux container 12.flux filter mesh 13.M8 hexagonal nut 14.star shaped hand wheel 15.adjustable tightening handle(2) 16.wave shaped hand wheel 17.straightening wheel 18.flux shutter 19.tractor base 20.Pressure regulation knob 21.clutch handle 22.torch bar 23.rubber hose 24.conducting plate 25.triangle flux container 26.wire feeder reductor 27.indicator 28.flux exit tube 29. traveling wheel 30. adjustable tightening handle(3) 31.drawing frame of the wire spool

■ Function of the parts:

▲ Travel of the tractor:

- The tractor will travel automatically by moving the clutch handle ⑳ to "auto" shift(closing the clutch). The tractor will stop traveling by moving the clutch handle ㉑ to "manual" shift (releasing the clutch) and it can be pushed forward or backward manually.



 attention	<ul style="list-style-type: none"> ● The surface for the tractor to work on should be even, paint residue, iron scrap and rubbish should be cleared away. ● The rail should be parallel to the workpiece.
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▲ Movement of the vertical column

- The vertical column can be moved for 70mm by rotating the wave-shaped hand wheel ⑯.

▲ Up and down of the cross beam

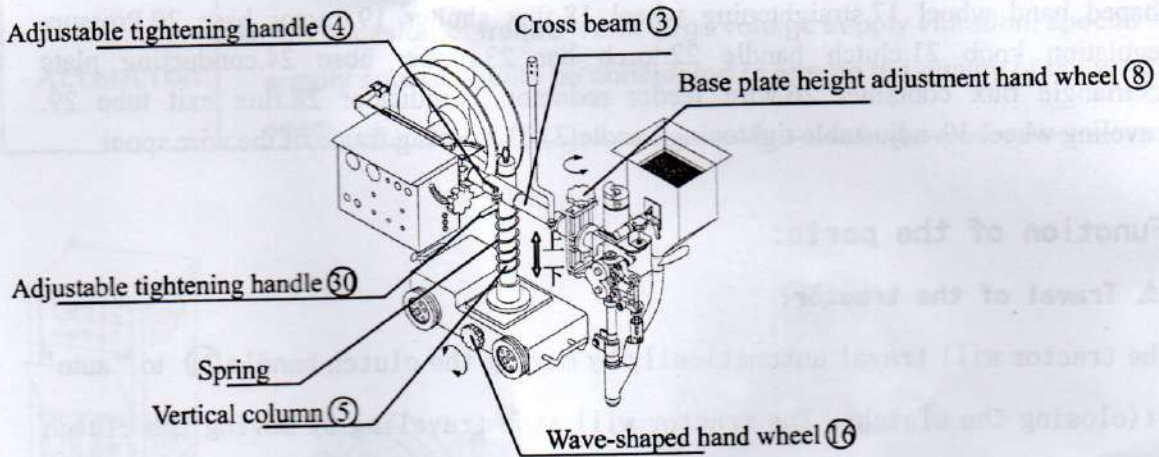
- The cross beam can move upward relying on the spring force itself or downward by pressing down spring for 70mm when loosening the adjustable tightening handle ⑳.

▲ Height adjustment of the tractor head

- The tractor head can be moved upward or downward for 100mm by rotating the base plate height adjustment hand wheel ⑧.

▲ Transversal movement of the tractor head

● The tractor head can move together with the cross beam transversally for 100mm by loosening the adjustable tightening handle ④.



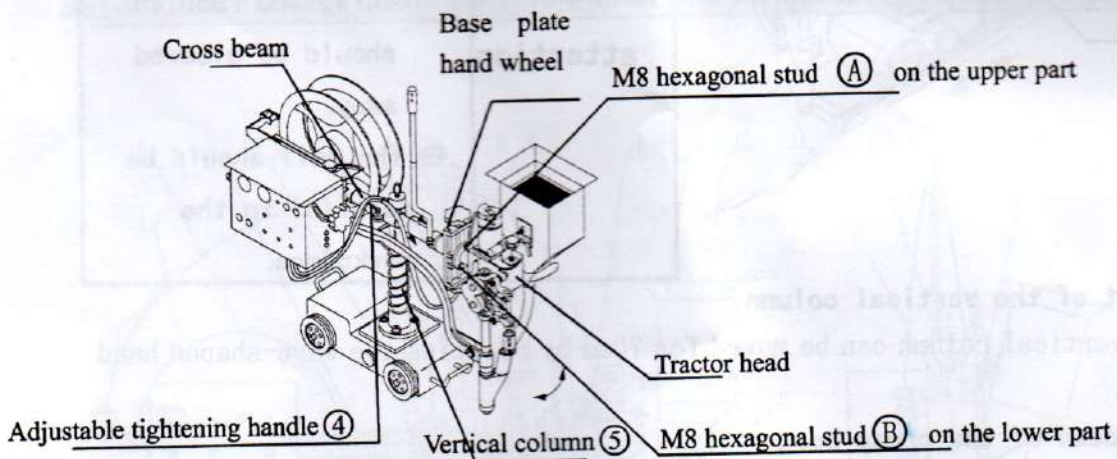
▲ The rotatable angle of the cross beam around vertical column is $\pm 90^\circ$

● The cross beam can rotate around vertical column ⑤ $\pm 90^\circ$ by loosening the adjustable tightening handle ⑩.

▲ Tractor head inclination $\pm 45^\circ$

● The tractor head can rotate $\pm 45^\circ$ by loosening that M8 hexagonal stud on the upper part of the rotary disk of the base plate hand wheel.

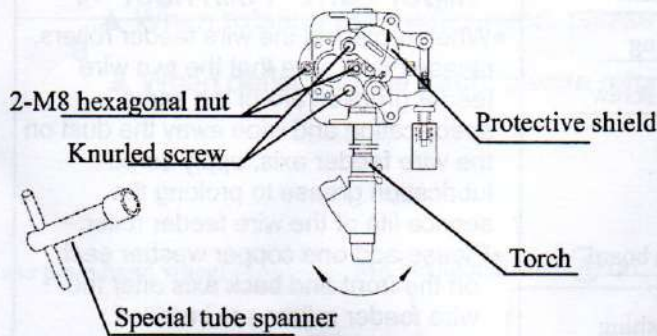
(Another M8 hexagonal stud on the lower part of the rotary disk of the base plate has been pre-set, there is no need to make any adjustment)



▲ Torch inclination $\pm 45^\circ$

● The tractor head bracket assembly can rotate together with the torch for $\pm 45^\circ$ by loosening the 2 knurled screw (no need to take off) on the tractor head bracket assembly, moving away protective shield, loosening 2 M8 hexagonal nut on the tractor head bracket assembly with the special tube spanner. When the desired angle is rotated to, restore the protective shield to its original

position and tighten the 2 knurled screw.

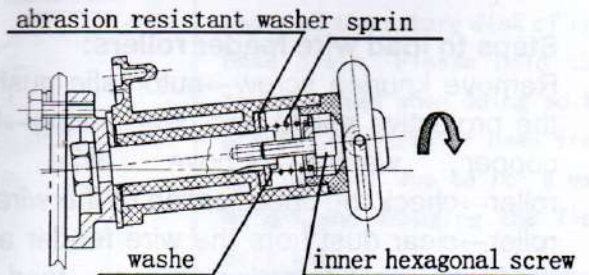


Important reminder!

The dust in the interface between the tractor head bracket assembly and the wire feeder reductor has to be cleared, otherwise, the dust may enter into the wire feeder reductor from the screw holes during the rotation of the tractor head bracket assembly and the torch, which will result in the wearing of the gears and other parts of the reductor

▲ Adjustment of the damping of the wire reel shaft

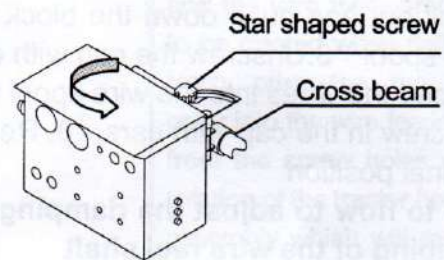
- The damping force has been Preset and in case adjustment to be made, please follow the following steps,
- ①remove the cap→②tighten the inner hexagonal screw to increase damping, loosen the hexagonal screw to reduce damping→③re-load the cap



- ▲ Tighten the inner hexagonal screw to increase damping
- ▲ Loosen the inner hexagonal screw to reduce damping

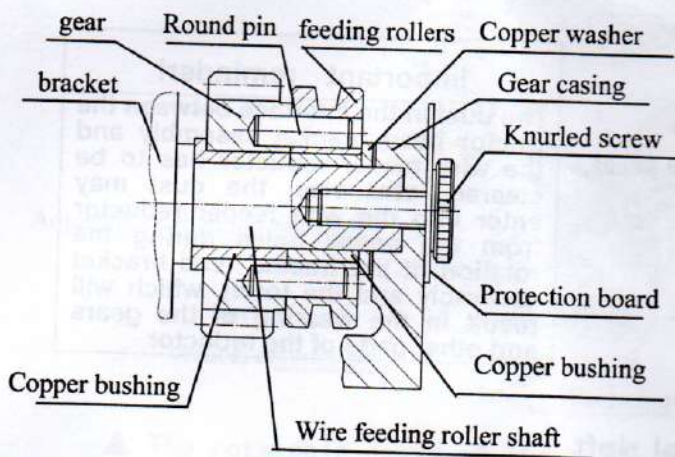
▲ Rotatable angle of the control box

- The control box can be rotated horizontally by loosening the star shaped screw on the top of the control box.



⑧ preparation before welding

- Please operate the tricycle tractor after connecting it to the power source according to following procedures,
 - Clear the welding area, clean away sundries such as rubbish, oil and dirt.
 - Please check carefully whether the size of the feeding roller matches with that of the wires to be fed.



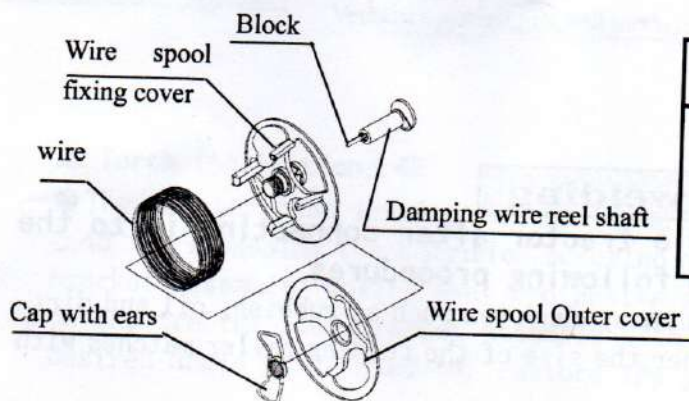
Steps to load wire feeder rollers:

Remove knurled screw → automatic push-out of the protective shield and gear casing → take off copper washer → remove wire feeder roller → check the specification of the wire feeder roller → clear dust from the wire feeder axis and apply some lubrication grease → load the 2 rollers of the same specification with the wires → re-load copper washer → close the gear casing → load the protective shield → tightening knurled screw

• Load wires

1. Pull out and push down the block of the damping wire reel shaft
2. Take off the wire spool
3. Unscrew the cap with ears
4. Take off the wire spool fixing cover
5. Load the wires into the wire spool fixing cover
6. Put on wire spool out cover
7. Screw in the cap with ears
8. Re-load the wire spool
9. Restore the block to its original position

As to how to adjust the damping force, please refer to the adjustment of the damping of the wire reel shaft



Important reminder !

- When replacing the wire feeder rollers, please make sure that the two wire feeder grooves are of the same specification and wipe away the dust on the wire feeder axis, apply some lubrication grease to prolong the service life of the wire feeder roller.
- Please add one copper washer each on the front and back axis after the wire feeder rollers are installed.
- After the wire feeder rollers are replaced, be sure to close the gear casing and the protective shield, tighten the 2 knurled screws to make the interface between the gear casing and wire feeding bracket assembly tight. The gear casing serves as both the protective casing and the brace for the wire feeder axis, it must be re-loaded after dissembled.
- The thickness of the copper washer must be strictly observed to prevent bad consequences.

Important reminder!

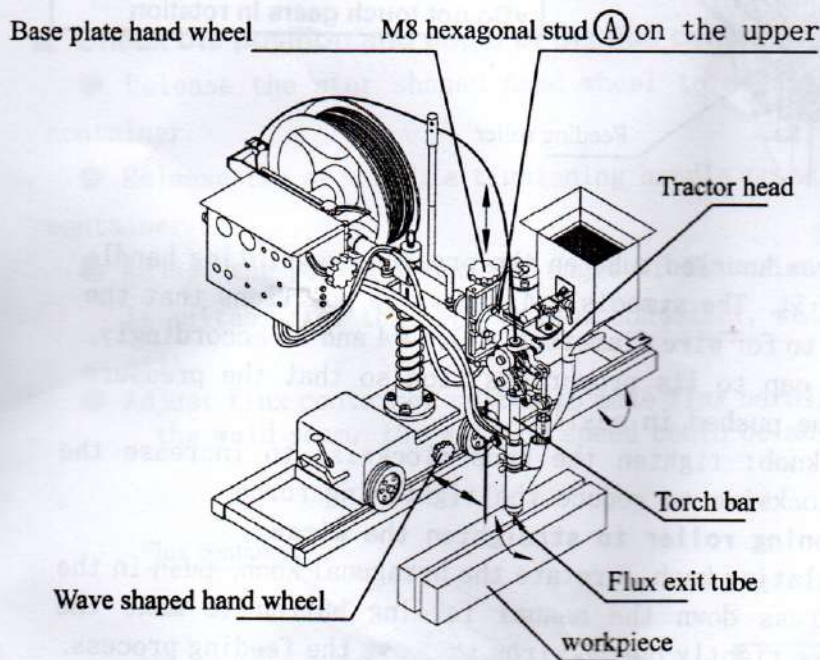
The block of the damping wire spool shaft has to be returned to its original position to prevent wire spool from falling off.

■ **Primary adjustment of the tractor head position**

▲ **Adjust the base plate hand wheel and wave-shaped hand wheel to move the torch to the weld seam**

▲ **When rotating the tractor head, please refer to tractor head inclination $\pm 45^\circ$ -PAGE 8**

▲ **When deflecting the torch, please refer to torch inclination $\pm 45^\circ$ -PAGE 8**



Important reminding!

In case to adjust the angle of the tractor head, loosen that M8 hexagonal stud (A) on the upper of the rotary disk of the base plate. Please hold the tractor head when doing so to prevent the tractor head from falling over due to its own weight and damaging the flux exit tube.

Important reminding!

The dust in the interface between the tractor head bracket assembly and the wire feeder reductor has to be cleared when deflecting the torch, otherwise, the dust may enter into the wire feeder reductor from the screw holes during the rotation of the tractor head bracket assembly which will result in the wearing of the gears and other parts of the reductor.

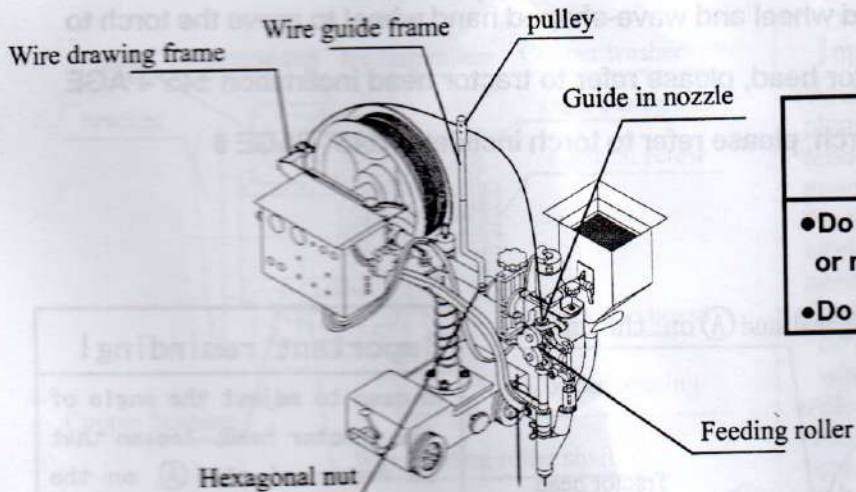


attention

The torch inclination should be no more than $\pm 45^\circ$, in case the angle is too big, the feeding angle of the wire will be changed and there will be more obstruction to affect the feeding results and it may burn feeding motor in worst case.

▲ **Adjusting the position of the wire guide frame**

- Draw out wires from the wire spool and guide it all the way to feeding roller through the wire guide frame, pulley and guide in nozzle. Tighten the hexagonal screw to fix the wire guide frame after proper adjusting.



Warning

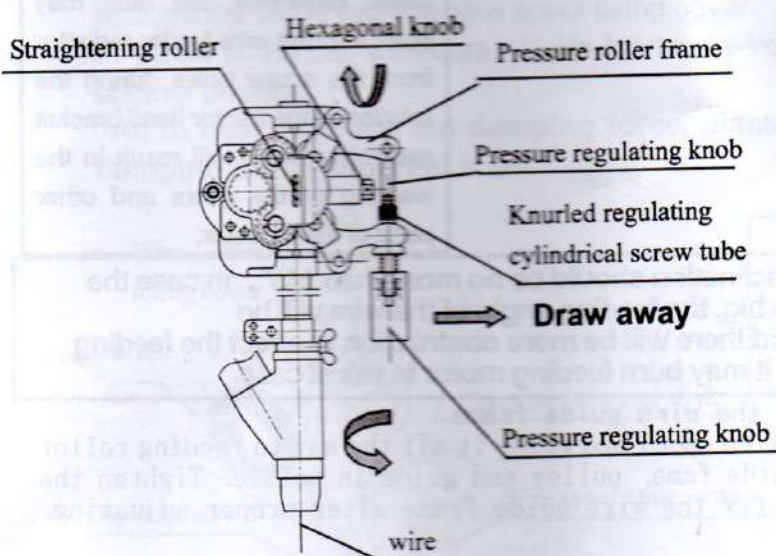
- Do not put on glove when guiding or replacing the wires
- Do not touch gears in rotation

▲ Press down wires tightly

- There is adjusting screw knurled tube on the pressure regulating handle with symbols 3, 4, 5 on it. The symbols 3, 4, 5 show the positions that the cap is to be adjusted to for wire diameters $\Phi 3$, $\Phi 4$ and $\Phi 5$ accordingly. Please regulate the cap to its proper position so that the pressure regulating arm can be pushed in easily.
- Pressure regulating knob: tighten the knob clockwise to increase the tightening force, counterclockwise to reduce the tightening force.

▲ Regulating the straightening roller to straighten the wires

- Release the pressure regulating knob, rotate the hexagonal knob, push in the straightening roller, press down the manual feeding button to make the straightening roller press tightly on the wires to start the feeding process. Close the pressure regulating knob and continue rotating hexagonal knob until the straightness of the wires measured by eye meeting the welding requirement.

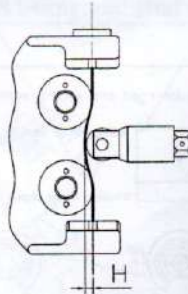


Important reminding!

The ideal pressure on the wire should be such that guarantees normal feeding of the wire and makes no slip. The scale of the pressure regulating knob should be set around 2-3, pressuring wires too tightly will increase the power consumption of the motor.

- ▲ Reference value of the straightness of the wire
The straightness of the wire sticking out within 100mm after straightening should be no more than 2.5mm. Please refer to the following chart,

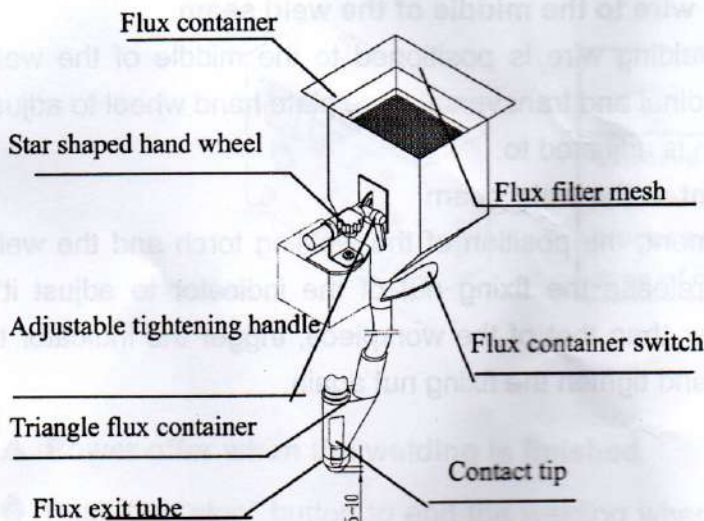
Straightness reference value	
Spec	Reference value H
Φ6	1.3
Φ5	1.0
Φ4	0.6
Φ3	0.4



Important reminding!
Over-straightening of the wires will cause wires to bend in opposite direction!

▲ Check the position and angle of the flux container

- Release the star shaped hand wheel to adjust the position of the flux container.
- Release the adjustable tightening handle to adjust the angle of the flux container.
- Adjust the position and the angle of the triangle flux container to make it suitable for that of the flux container, which will ensure smooth flux exit.
- Adjust flux container switch to make flux barely cover the contact tip and the weld seam, the welding speed could be adjusted by eye measurement.



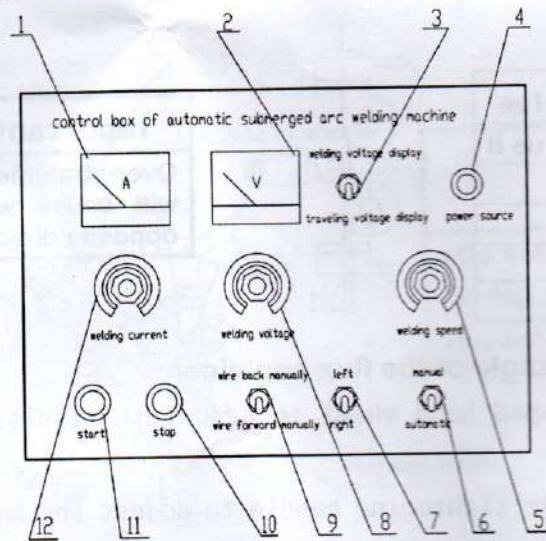
Notation
The arc distance of 5-10mm between the contact tip and the flux exit tube has been set beforehand.

▲ Set welding current, voltage and speed

- The welding current, voltage and speed is pre-set accordingly to the thickness of the workpiece, welding engineering requirement.

- ▲ Press down the power button to light the indication lamp and power on the tractor

- Move the manual/automatic shift to manual to start feeding the wires manually, letting wires go through the torch bar and into the contact tip for the preset length.



- 1 ammeter 2 voltmeter 3 selection switch 4 power source indication lamp 5 welding speed adjustment knob 6 manual or automatic changeover switch 7 left or right changeover switch 8 welding voltage adjustment knob 9 wire forward or backward changeover switch 10 stop button 11 start button 12 welding current regulation knob

■ Minor adjustment of the position of the tractor head

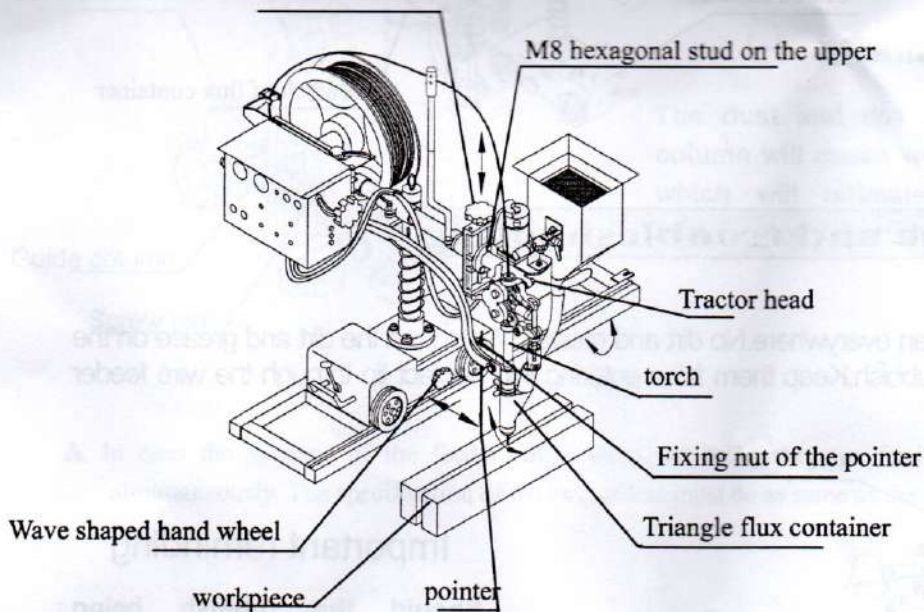
▲ Minor adjust the welding wire to the middle of the weld seam

- observe whether the welding wire is positioned to the middle of the weld seam, rotate the longitudinal and transversal base plate hand wheel to adjust until the desired position is adjusted to.

▲ Adjust the pointer to point at the weld seam

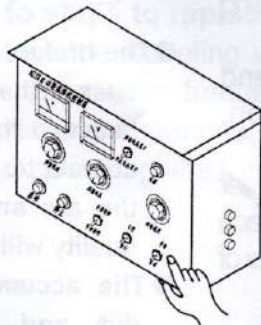
- After the minor adjustment, the position of the welding torch and the weld seam have been set, release the fixing nut of the indicator to adjust its position 10-15mm higher than that of the workpiece, trigger the indicator to point at the weld seam and tighten the fixing nut again.

Base plate height adjustment hand wheel



■ Power on to start the welding

- ▲ move the “manual/automatic” shift to “automatic” and press the “start” button until the arc is ignited to start the welding.

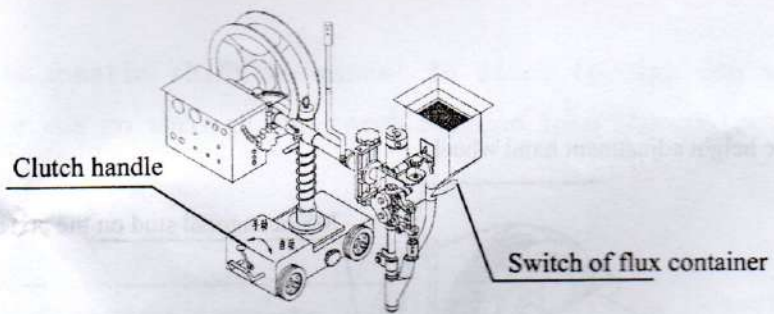


Important reminding!

Observe whether the indicator is to the middle of the weld seam during welding process and make adjustment immediately in case of deflection.

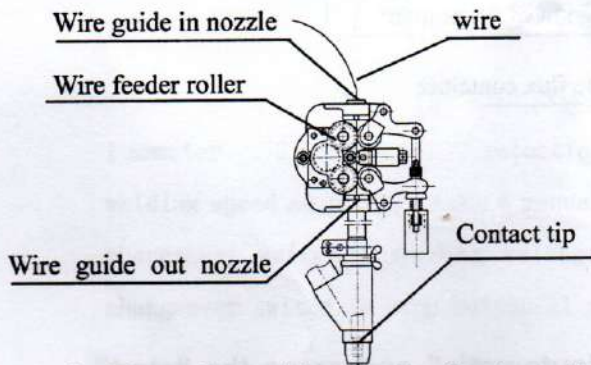
▲ Power offer when the welding is finished

- Push the “stop” button to end the welding when the torch reaches the end of the weld seam. Close the switch of the flux container and power off. Move the clutch handle on the tractor base to “manual” and drag the tractor out of the welding area



⑨ maintenance and troubleshooting

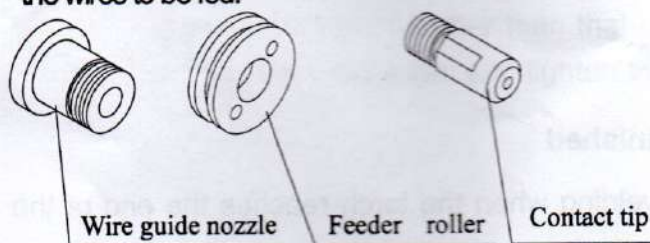
▲ Keep the wire path clean everywhere. No dirt and grease. Watch out the dirt and grease on the wire, steel rust and other rubbish. Keep them from entering into contact tip through the wire feeder roller.



▲ The wire guide nozzle, feeder roller and contact tip should be cleaned periodically, removing dirt and dust, the accumulation of which will result in the instability of the feeding performance.

▲ The loose at the connection of the contact tip and torch bar will cause overheating at the connection, burning of the contact tip and difficulty in replacing.

▲ The serious wearing of the wire guide nozzle and feeder roller will cause deterioration of the feeding performance, replace them immediately with the right ones matching with the size of the wires to be fed.



▲ Keep the screw bar and guide column on the longitudinal and transversal base plate clean and apply lubrication, clean off after application and apply lubrication for maintenance.

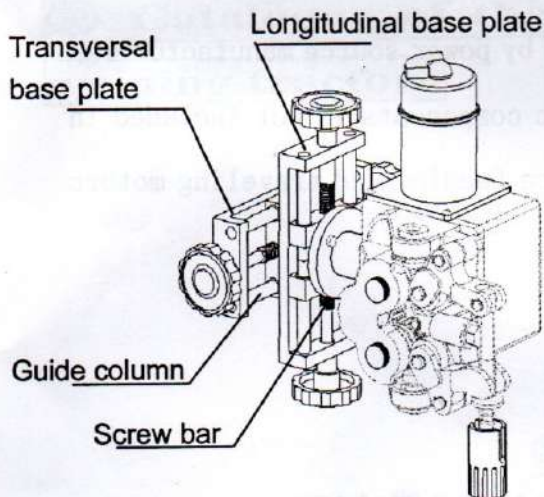
Important reminding

Should the rubbish being brought into the contact tip and feeder roller, the wearing of the feeder roller will be fastened and resulting in instability of the feeding performance.



Attention

- The broken contact tip will cause the bad contact between the wire and the contact tip, the stability of the arc and the welding quality will be affected.
- The accumulation of the dirt and dust on the contact tip and feeder roller, serious wearing of the roller groove will cause unstable feeding performance.



attention

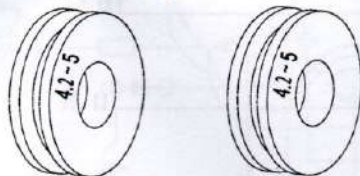
The dust and dirt on the screw bar, guide column will cause wearing and larger spacing, which will ultimately affect the regulation accuracy of the torch.

- ▲ In case the grooves of the feeder roller worn out seriously, two feeder rollers must be replaced simultaneously. The specification of the two rollers must be as same as that of the wires.



attention

In case the grooves of the feeder roller worn out seriously, two feeder rollers must be replaced simultaneously.



Please refer to steps to replacing feeder rollers when replacing feeder rollers

- ▲ Maintenance of the traveling wheel: the design of the outer ring of the traveling wheel adopts the rubber featuring anti-oil, anti-acid and anti-alkaline, given the vast different application situations. Keeping the traveling wheel from direct contact with oily, sharp scrap iron, glass fragment and acid and alkaline mediums.



Attention

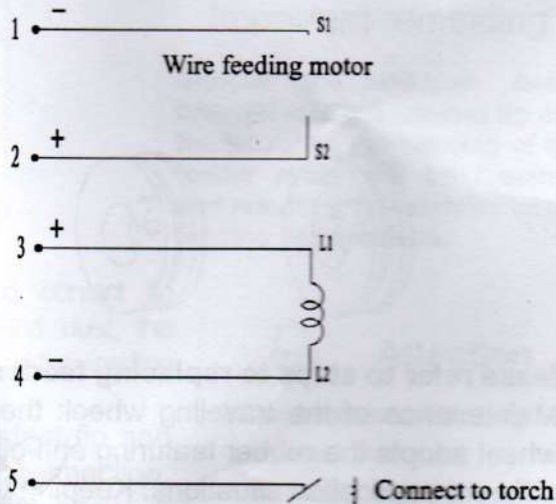
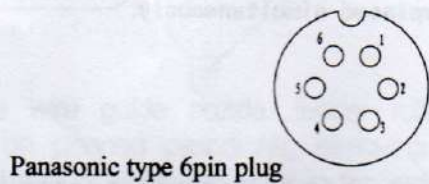
The acid and alkaline mediums will shorten the service life of traveling wheel.

- ▲ Check the electric circuit and electronics components periodically, repair and replace them immediately when necessary.
- ▲ Keep cables in good condition, check the insulation of the cables frequently, stop working and replace the cable if it is damaged.

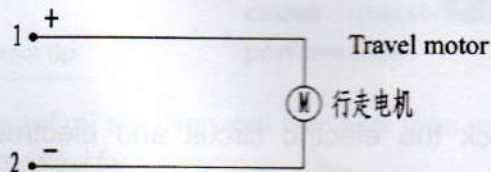
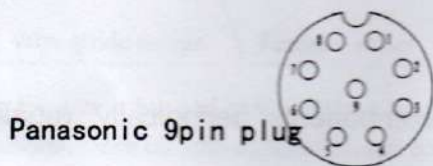
■ special notation

▲ The PC board inside the control box is provided by power source manufacturers, the circuit failure and repair of the electric components is not included in this instruction manual. Only diagrams for wire feeding and traveling motors are provided here.

● The diagram for connecting wire feeding motor.

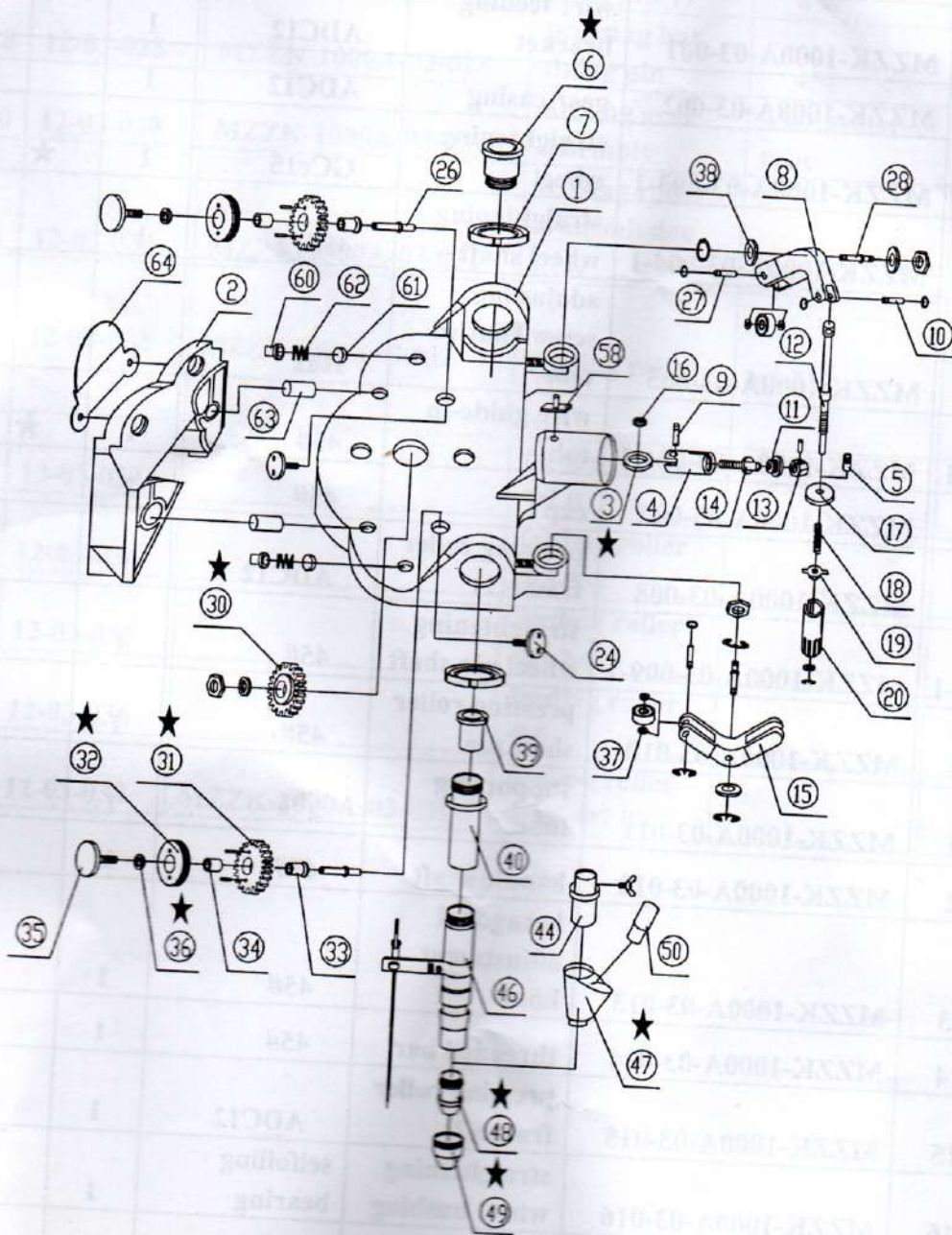


● The diagram for connecting travel motor.



⑩ Catalogue of the parts on the submerged arc welding tractor

Tractor head bracket assembly



Notes: "★" refers to wearable parts

**Catalogue of parts on the submerged arc
welding tractor MZZK(tractor head) table 1(cont)**

no	code name	figure number	name	material	QTY	note
1	12-03-001	MZZK-1000A-03-001	wire feeding bracket	ADC12	1	
2	12-03-002	MZZK-1000A-03-002	gear casing	ADC12	1	
3	12-03-003-1	MZZK-1000A-03-003-1	straightening wheel	GCr15	1	★
4	12-03-004-1	MZZK-1000A-03-004-1	straightening wheel shaft	45#	1	
5	12-03-005	MZZK-1000A-03-005	adusting screw knurled tube	H62	1	
6	12-03-006-1	MZZK-1000A-03-006-1	wire guide-in tube	45#	1	★
7	12-03-007	MZZK-1000A-03-007	cap	45#	2	
8	12-03-008	MZZK-1000A-03-008	pressing roller frame(1)	ADC12	1	
9	12-03-009-1	MZZK-1000A-03-009-1	straightening wheel pin shaft	45#	1	
10	12-03-010	MZZK-1000A-03-010	pressing roller shaft pin	45#	1	
11	12-03-011	MZZK-1000A-03-011	supporting tube	45#	1	
12	12-03-012	MZZK-1000A-03-012	handle shaft	45#	1	
13	12-03-013	MZZK-1000A-03-013	hexagonal adjustment knob	45#	1	
14	12-03-014	MZZK-1000A-03-014	threaded bar	45#	1	
15	12-03-015	MZZK-1000A-03-015	pressing roller frame(2)	ADC12	1	
16	12-03-016	MZZK-1000A-03-016	straightening wheel bushing	selffoiling bearing	1	
17	12-03-020	ZK-SB-B-01-20	steel bowl	Q235A	2	punched
18	12-03-018	MZZK-1000A-03-018	spring	65Mn	1	
19	12-03-019	ZK-SB-B-01-18	special shaped hexagonal nut	Q235assembly	1	
20	12-03-017	MZZK-1000A-03-017	pressure	ABS	1	