

MOTOWELD-S350-AJ2 &-[]E2 INSTRUCTIONS

Upon receipt of the product and prior to initial operation, read these instructions Thoroughly, and retain for future reference.

Do not submit this electronic data to the customer.

THIS MATERIAL IS FOR STUDY PURPOSE ONLY.
YOU MUST READ THE MANUAL WHICH ENCLOSED
WITH A ROBOT.

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This manual explains MOTOWELD-S350 operation and how to use them.

Please read this manual carefully and be sure to understand the contents before handling the MOTOWELD-S350.

1. CONFIGURATION AND SPECIFICATION

Rated Specifications

Ratings for power supply Unit and welder		YWE-S350- 「 」			
		AJ2	2E2	3E2	4E2
Rated input voltage and number of phases	[V]	200 or 220	380	415	440
		± 10% , three-phase			
Rated frequency	[H z]	50 / 60			
Rated input	[k V A]	18			
	[k W]	15			
Welding current adjustment range	[A]	50~350			
Welding voltage adjustment range	[V]	16~36			
Rated duty cycle	[%]	60			
Wire feed speed	[m/min]	Wire size switch 「φ1.2」 side : 2 ~ 15.5			
Range of analog input voltage	[V]	0 ~ 14			
Gas pre-flow time	[s]	0 (can be internally reduced to 0.4s)			
Gas after-flow time	[s]	Approximately 2 (delay time of voltage 2s)			
Wire feed slow-down speed	[m/min]	Approximately 2			
Robot interface		Included			
Dimensions (W×D×H)	[m m]	360(W)×605(D)×605(H)			
Weight	[k g]	Approximately46			
Standard accessories	Fuse contained in glass tube 5A,8A,10A	Each 1			

2. INSTALLATION AND CONNECTION

2.1 Place of Installation

This equipment is designed to be operated under the following conditions :

- (1) In a dry indoor location spaced at least 30cm away from walls and from other surrounding articles.
- (2) At a place that is not exposed direct sunlight or rain.
- (3) At ambient temperatures from -10°C to +40°C
- (4) At altitude not exceeding 1000m .
- (5) Not in the presence of gases or dust exceeding the amount that can be caused by normal arc welding.

[Attention for installation]

Fixed the carrier wheels under the power source , before using power source.

2.2 Precautions for Grounding

- (1) Be sure to carry out secure grounding work on the welder for safety. If the unit is not properly grounded , its case may be charged and operation of the unit may become unstable.
- (2) Connect a grounding cable of 14mm² or thicker to the terminal marked "GROUND" or "EARTH".

Be sure turn off the main switch on the distribution panel before performing the grounding work.

- (3) Be sure to ground the base metal as well when or any other non-conductive material is place under the base metal.
- (4) If there is a pool or pond between the grounding of the power distribution panel and the welding machine , the lead current is concentrated in the pool or pond. In such a case , connect the grounding with a cable to escape the leak current through the cable.

2.3 Wind Shielding and Ventilation

For outdoor use or in cases where a fan is used, take wind protecting measures to prevent direct wind on the arc.

2.4 Required Power Supply Conditions and Cable Sizes

The rated power supply voltage for this welder is three-phase 200/220V(AJ2 -Switch type), 380V(2E2),415V(3E2),440V(4E2).The welder supports a voltage compensation circuit so that the equipment can operate at a power voltage within $\pm 10\%$ fluctuations of the rated value. All the same , it is recommended to use a power source as stable as possible. If fluctuations in power supply voltage exceed 10% of the rated value , power welding conditions cannot be guaranteed and problems may occur.

Diameter of the input power cable and the fuse capacity must be in compliance with Table 2-1.

Install a non fuse breaker (NFB) or a switch with fuse for each welder.

The non fuse breaker used should be the same capacity of the fuse indicated in Table 2-1 , and the tripping time at 600% of the rated current should be one second or longer. (General motor breakers satisfy these requirements.) If breaker capacity is insufficient or primary voltage is too high , the breaker will be tripped at power on.

Table 2-1 Power supply capacity and power cables

Power supply capacity(kVA)	20(350A class)
Fuse capacity (A)	75(350-AJ2)
Input cable (mm ²)	14 or greater
Output cable (mm ²)	38 or greater(350A class)*1
Grounding cable (mm ²)	14 or greater

*1: Do not use small diameter cables, otherwise fire could occur.

2.4 Combination with Earth Leakage Breaker

The earth leakage breaker to be used should be of current sensitivity of 30mA or greater , or equivalent low-sensitivity leak breaker.

2.7 Connecting Electrical System

DANGER: ELECTRIC SHOCK CAN KILL .Open the disconnect switch, or breaker, and determine that no voltage is present, before connecting wires between welding machine and power supply.

(1) Connecting power supply

Junctions should be securely insulated.

See fig.2-1.

(2) Connecting blocks in the welder

See fig.2-2.

For CO₂ gas , MAG gas and MIG gas arc welding , connect the base metal to the minus cable and connect the torch (wire) to the plus cable. (This is called reverse polarity or electrode positive.)

(3) Connecting control cable

Connect the front connector to the control cable of a wire feeder and connect the interface connector to control cable of a robot. (See fig 2-1)

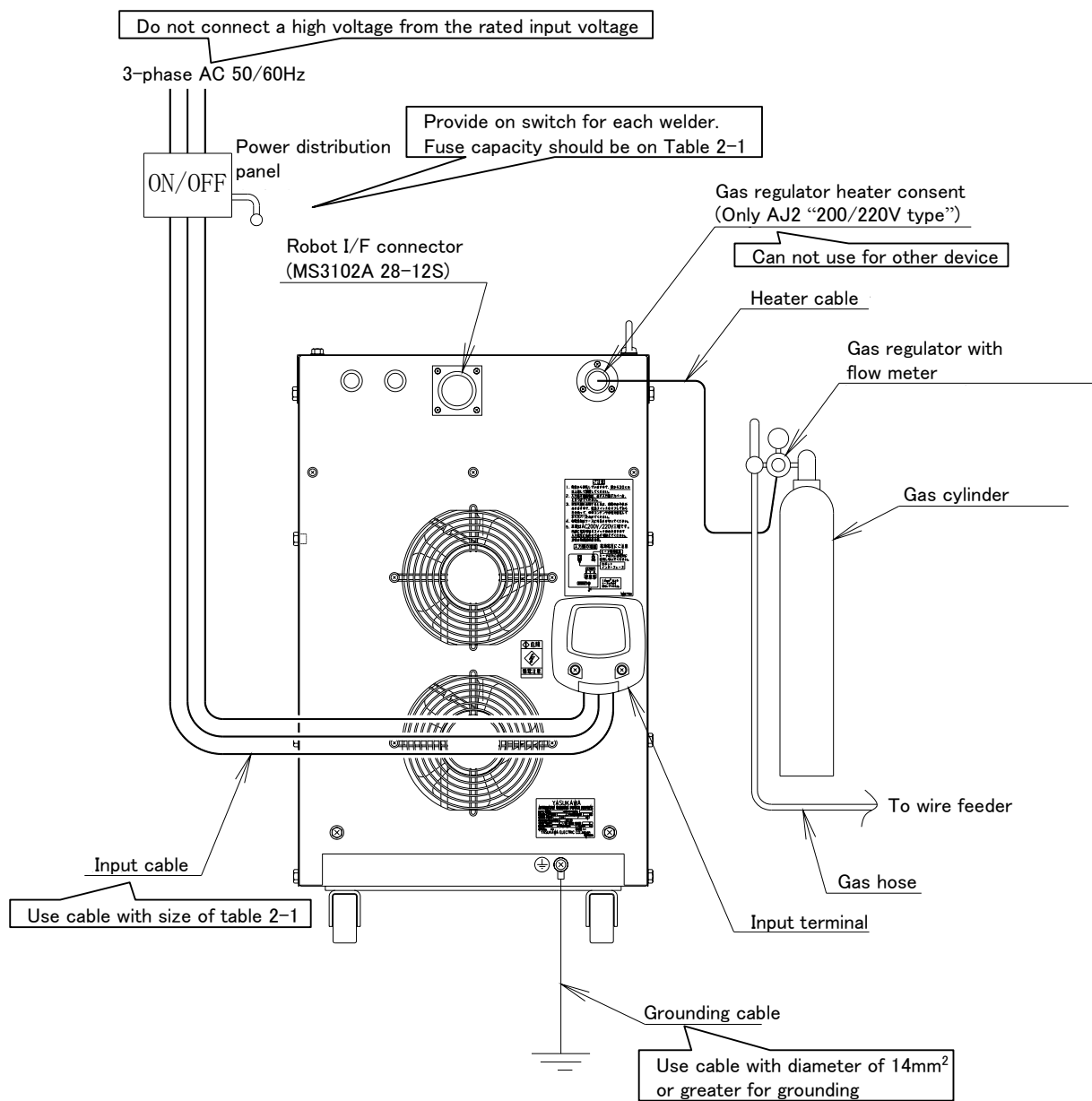


Fig 2-1 Connection of rear side of welder

The main switch of the power distributor panel must be turn off while wiring

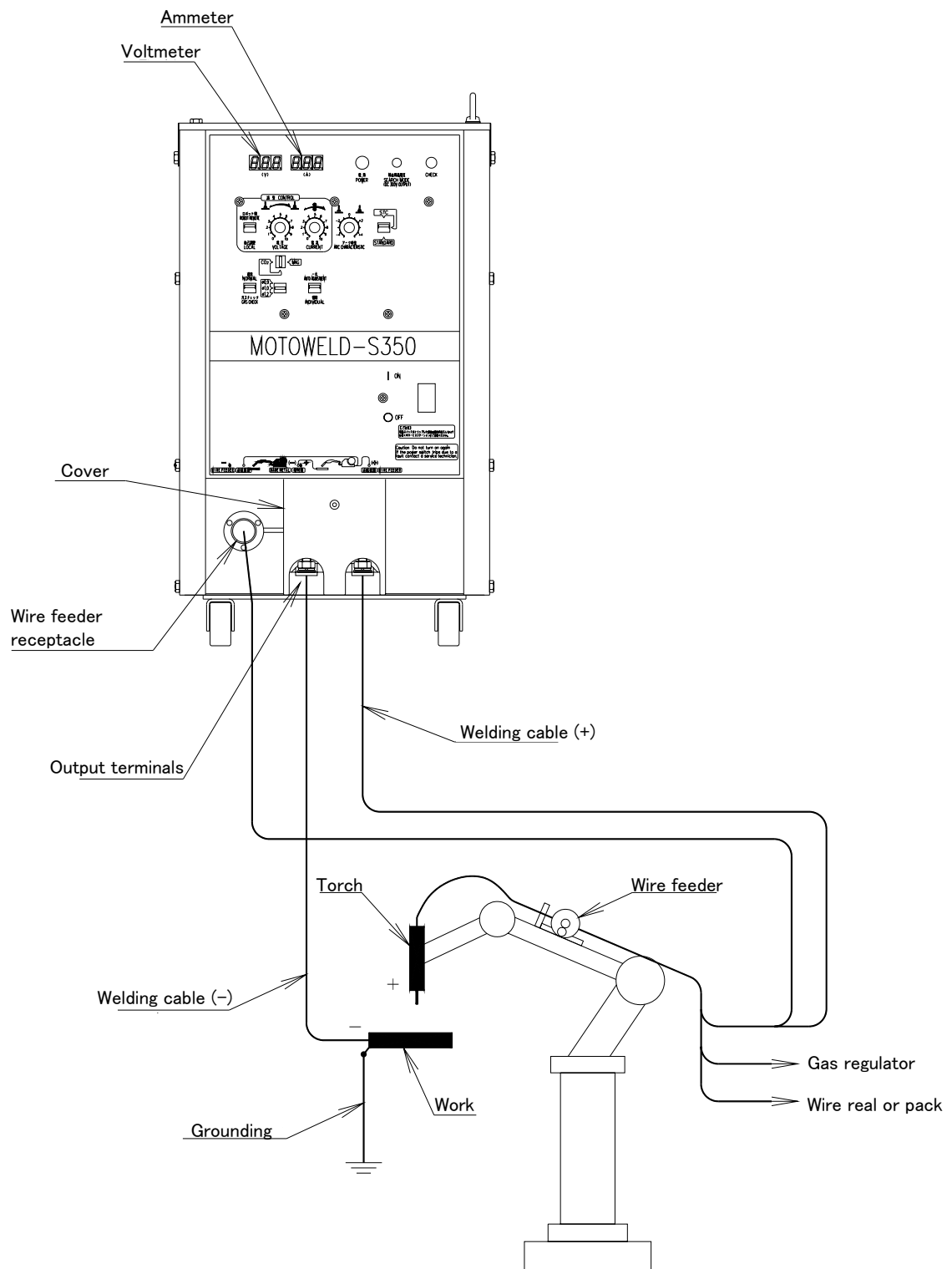


Fig 2-1 Connection of front side of welder

(5) Grounding

A grounding terminal (solder-less terminal) is provided for safety in the lower part on the back of the welding power supply unit. Carry out grounding work using a cable of a diameter of 14mm².

Resistance of grounding must be less than 100 ohm.

The ground must be different from a ground of robot.

2.6.1 For mixed gas or Co2 gas welding

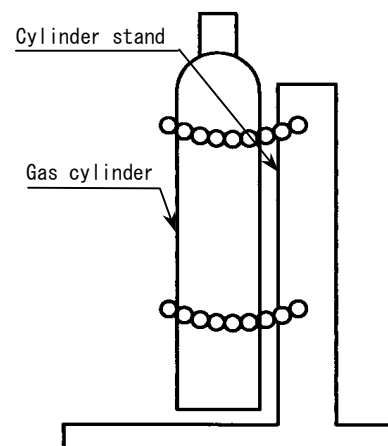
- (1) Remove dust from the gas cylinder connecting port. Install the MAG / argon common gas pressure regulator. Check the quality of the gas and the type of the cylinder.
- (2) Insert one end of the supplied rubber gas hose into the outlet of the gas pressure regulator , the other end into the gas terminal inlet of the wire feeder. Clamp both ends securely with hose bands.
- (3) When shielding gas is CO₂ gas, connecting heater consent is need.

2.6.2 Precautions for Gas and Gas Cylinders

High Pressure gas cylinders must be handled with care. Observe the instructions in the operation guide attached to the gas regulator.

(1) Where to place gas cylinders

Place gas cylinders in a specified gas container position that is not exposed to direct sunlight. If gas cylinders are unavoidably placed at the welding site , they must be fixed to posts or cylinder stands in an upright position to keep from falling. Also , the gas cylinders must not be heated by a welding arc or the like.



(2) Type of gas cylinder

Co₂ gas-filled cylinders can be classified into two types : One is the general type that is not the siphon type , and the other is the siphon type.

Never use siphon type gas cylinders. The attached CO₂ gas pressure regulator is not applicable to siphon type gas cylinders. If the regulator is connected to a siphon type gas cylinder , the contents of the cylinder are not gaseous and enter the regulator as remaining liquefied. This causes problems.

Fig2-3 Fixing the gas cylinder to keep it from falling.

(3) Quality of gas

Moisture or impurity in the CO₂ , argon , or mixed gas used to shield welding arcs adversely influences welding. High purity and low moisture gas must be used.

Use MAG gas containing 80% argon and 20% CO₂ gas for mixed gas. The gas mixing ratio of MAG gas is constant , which contributes to constant welding quality.

Use **CO₂ gas** designated as “for welding” or what conforms to Class 3 specified in JIS K

1106 (moisture content 0.005% or less) or equivalent.

Use high purity **argon gas** for welding specified in JIS K 1105 (99.9% or higher purity).

Avoid using moist gas, not only for the adverse effect on welding, but also because it may cause clogging in the gas regulator if the water content freezes.

2.7 Consolidation of Ambient Conditions

(1) Wind shielding

In general, approximately 1.5m/sec or less wind is permitted at the site of welding using shielding gases. If the wind blows at greater velocity, stop welding or apply appropriate protection (shield, etc.).

Even when welding is carried out indoors, wind shielding measures must be taken if pneumatic tools or fans are nearby.

(2) Ventilation

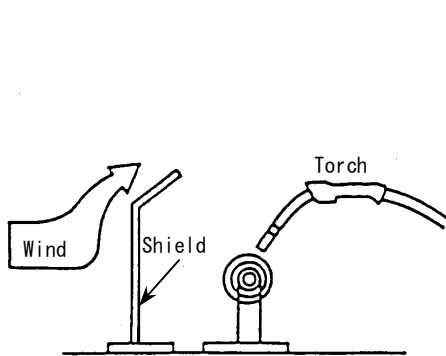


Fig.2-4 Shielding wind for welding

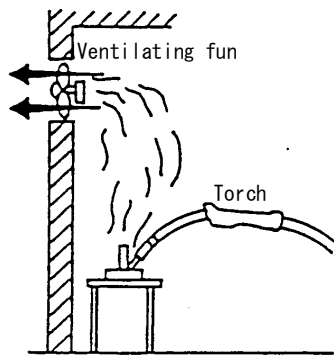


Fig.2-5 Example of ventilation

Although little fumes are emitted by shield gas welding arc welding, a small amount of carbon monoxide occurs from decomposition of carbon dioxide used as the shielding gas.

If welding is done indoors or in a confined area, ventilation must be provided or planned for. Avoid blowing air on the operation site. Instead, drive out accumulated gases (by using a ventilating fan or exhaust duct).

(3) Light shielding

For welding sheets, for which weak arcs are used, use a helmet and a hand shield with light screening glass specified in JIS T 8141 or Light screening No.8 to 10, taking visibility of arc points into account. For welding plates, for which stronger arc light is used, adopt No.10 to 13. For pulse-MAG or MAG welding, for which much stronger arc light is required compared to CO₂ welding, use shields of greater light screening numbers.

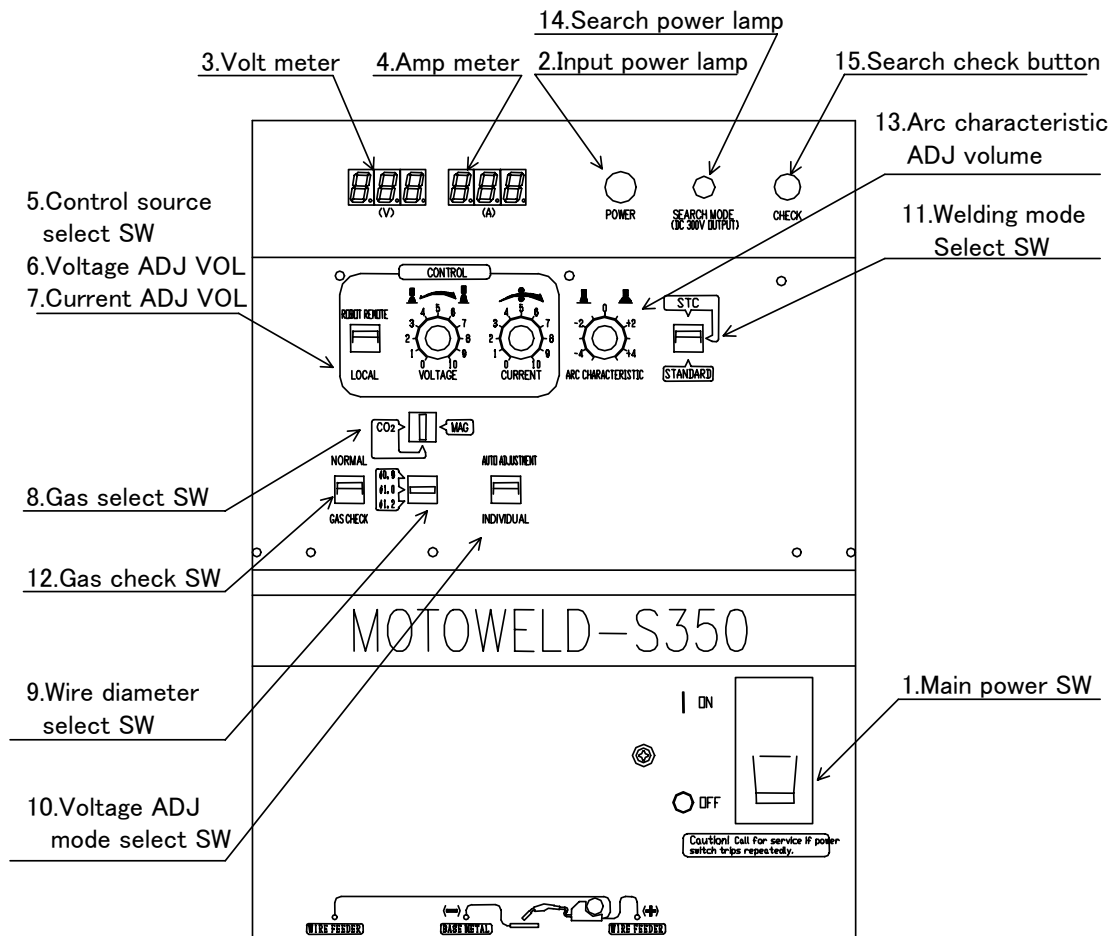
The welder brings in ultraviolet rays stronger than that caused by manual welding. Periodically check protectors for eyes and the skin. Always wear these protectors.

3. PREPARATION FOR WELDING

Order	Item	Description
1	Setting wire	Set a wire suitable to the welding method. The torch is lined with soft teflon. Before setting the wire , remove sharp points from the wire end by using a file.
2	Checking torch	Confirm that a contact tip suitable to the diameter of the wire is installed on the torch. For details , refer to Torch Operating Guide.
3	Turning on main switch on power distribution panel	Confirm that connections are proper , then turn on the main switch of the power distribution panel of the welder.
4	Turning on switches for welders.	Turn on the power switch. The power indicator lamp goes on and the built-in cooling fan starts rotation.
5	Checking the switch of selecting control.	Select "ROBOT REMOTE". Only in case of checking of welder function, select "LOCAL".
6	Wire inching	Press the inching button on the programming pendant of the robot controller , and do not release the button until wire comes out from the end of the torch. The wire feed speed can be modified by using the welding current control signal from the robot controller.
7	Adjusting gas flow	(a) Turn the gas switch to "CHECK" on the panel of welder. (b) Turn the valve of the gas cylinder counterclockwise to open. (c) Turn the knob of the gas pressure regulator to adjust the flow according to welding conditions. Proper gas flow rate is 15 to 25 liters per minute. The flow rate must be increased in proportion to the welding current. (d) Turn the gas switch to "NOMAL" on the panel of welder and stop gas discharge.
8	Selecting welding method	Set select switches on the panel of welder.
9	End	

4. WELDING OPERATION

4.1 Operation of front panel



1. Main power SW

Main power of the welder is turned on and off with this switch.

2. Input power lamp

This lamp lights when main power of the welder is turned on.

3. Volt meter

When main power of the welder is turned on, this meter does the display.
The arc voltage is displayed in this meter while welding.

4. Amp meter

When main power of the welder is turned on, this meter does the display.
The welding current is displayed in this meter while welding.
When abnormality occurs in the welder, the alarm code is displayed in this meter.

5. Control source select SW

Whether the welding current and the arc voltage are adjusted by the robot or the welder is selected with this switch.

Please select "ROBOT REMOTE" side when you adjust the welding current and the arc voltage from the robot.

6. Voltage ADJ VOL

When Control source select SW has selected "LOCAL" side, the arc voltage can be adjusted by this volume.

7. Current ADJ VOL

When Control source select SW has selected "LOCAL" side, the welding current (= wire feeding speed) can be adjusted by this volume.

8. Gas select SW

Please select this switch from either "CO2" or "MAG" (mixture gas) according to the welded shielding gas.

9. Wire diameter select SW

Please select this switch according to the wire diameter used.

10. Voltage ADJ mode select SW

The method of adjusting the arc voltage is selected with this switch.

In the method of adjusting the arc voltage, there are "AUTO ADJUSTMENT" and "INDIVIDUAL".

Please refer to * page * for a detailed explanation of "AUTO ADJUSTMENT" and "INDIVIDUAL".

11. Welding mode select SW

The welding method is selected with this switch.

In the welding method, there are "STANDARD" and "STC" (for high speed welding).

12. Gas check SW

It is possible to gas-check with this switch.

When "GAS CHECK" side is selected with this switch, the gas valve is opened in the mandatory action.

Please select "NORMAL" side at usual use.

13. Arc characteristic ADJ volume

The arc characteristic can be adjusted by this volume.

When you turn this volume to (-) side, the arc characteristic becomes hard.

When you turn this volume to (+) side, the arc characteristic becomes soft.

14. Search power lamp

This lamp lights when the DC about 300V is output by Search function.

15. Search check button

The detection signal to the robot of Search function and lighting Search power lamp can do the confirmation by pushing this button.

Even if this button is pushed, the DC about 300V is not output.

It is necessary to add the optional board to use Search function.

4.2 Adjusting welding condition

4.2.1 Adjusting welding current and welding voltage

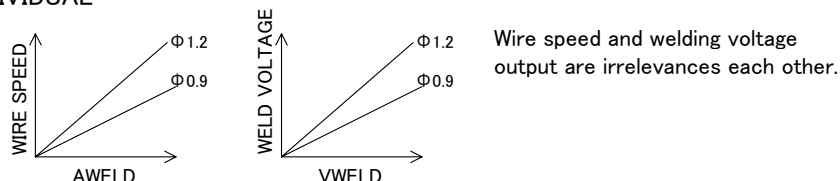
The welding current of the welder(=Wire speed) is adjusted by the analog voltage for current(=AWELD) of the robot. And, The welding voltage of the welder is adjusted by analog voltage for voltage(=VWELD) of the robot.

Note: "AWELD", "VWELD" are the robot instruction.(Same meanings: ARCSET,ASF# ...)

The welder has 2 ways of voltage adjusting method , "INDIVIDUAL" and "AUTO ADJUSTMENT".

Difference of operation of welder according to voltage adjustment mode (INDIVIDUAL/AUTO ADJUSTMENT)

① INDIVIDUAL

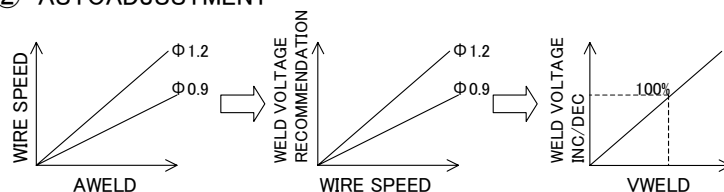


Wire speed and welding voltage output are irrelevant to each other.

The user individually adjusts wire speed (=welding current) and welding voltage directly.

EX) ARCSET AC=140A AV=17V

② AUTOADJUSTMENT



The user does the adjustment of wire speed and the fine control of welding voltage.

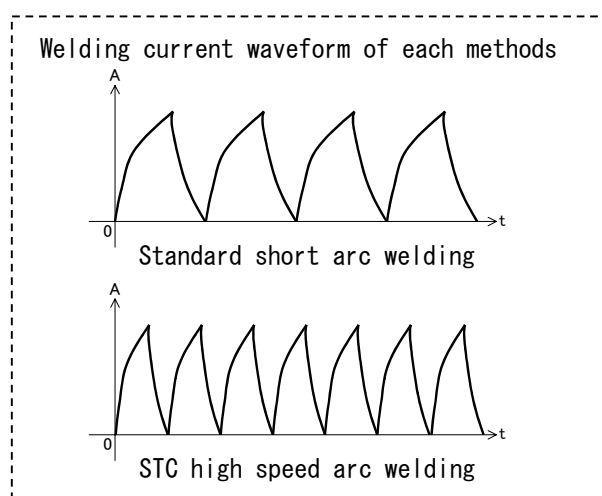
EX) ARCSET AC=140A AVP=95%

4.2.2 About STC mode

The welder has the special welding method that STC (=Short transfer control) mode.

This method makes more high frequency current waveform in short arc welding.(1.5 to 2 times of standard)

This welding method is good for high speed welding and low current welding , because high frequency arc can keep short arc length.



4.3 Wire Extension

The wire length from the torch tip to the arc point is called wire extension. Keep this length constant during welding.

The wire extension is :

15mm for wire diameter $\phi 1.2$

10mm for wire diameter $\phi 0.9$

4.4 Direction of welding and Torch Angle

Either backhand welding (same as manual welding), in which the torch is tilted by 5° to 30° in the direction of welding, or forward welding, in which welding is carried out in the same state but in the opposite direction, can weld. However, forward welding is more popular in robot welding.

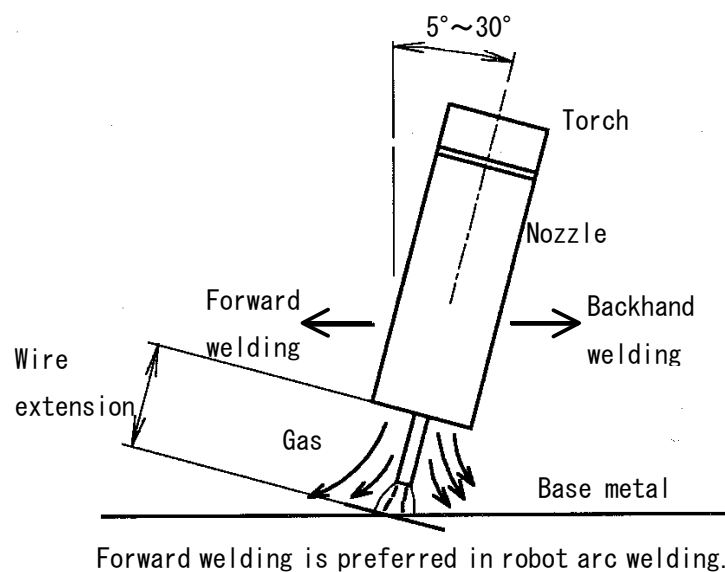


Fig.4-4 Direction of Welding
and Torch Angle

4.5 Modification when extension cable are used

When an extension cable is used, actual output between the torch and the welded object decreases of voltage drop in the cable. To prevent this, set the voltage adjustment signal higher than the target voltage value. Fig. 4-5 gives a measure of drop along an extension cable.

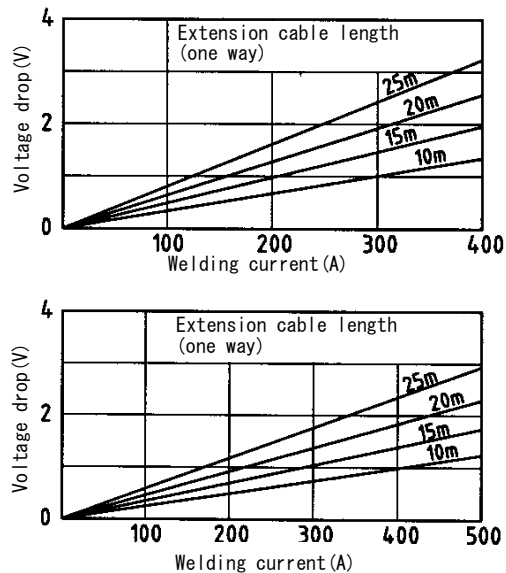


Figure 4-5 Measure of voltage drop along extension cable

This graph indicates the relationship between voltage drop and welding current when an extension cable of **60mm²** is used. If extension cables are used for both ways, the voltage drop is twice as much as the value indicated in this graph.

This graph indicates the relationship between voltage drop and welding current when an extension cable of **80mm²** is used. If extension cables are used for both ways, the voltage drop is twice as much as the value indicated in this graph.

5. PRECAUTIONS FOR USE

5.1 Warning monitor lamp

In MOTOWELD, the occurrence of the alarm is displayed on the display.

A digital display of the current meter is used for the display of the alarm display.

No	Display	Alarm	Measures
1	E & 1	Input over current	It is defective performance of an internal circuit. Please report to the service station.
2	E & 2	Output over current	The welder stops when the over current flows for one second or more. Please confirm whether neither (+) nor (-) of the output to be short-circuited.
3	E & 3	Input over voltage	Please confirm the input potential is not 230V or more.
4	E & 4	The temperature is abnormal.	The duty cycle of this welder is 60%. Please lower the duty cycle.
5	E & 5	Input potential shortage	Please confirm the input potential is not 170V or less.
6	E & 6	Hydraulic pressure shortage	No Use
7	E & 7	open-phase	Please confirm whether one aspect in the three-phase is a un-connection.
8	E & 8	Setting is abnormal.	Please confirm setting according to the dip switch and the RS232C communication.

5.1 Tripped Power Supply Switch

If the power supply switch is tripped, do not turn it on again. Please contact the nearest service branch. If the power were to be turned on again, the problem may be compounded and may affect the welding.

5.2 Precaution for Welding Construction

- (1) The welding current flows to the wire while welding. Please do not touch the work piece when moving the welding position. The system still has a 2 second delay once the welding start has been turned off, so please exercise caution. Be careful while the welding voltage is turned on. Also, the start point searching puts off a charge of about 300V, so be sure not to touch it.

(2) Bend of conduit cable

If a conduit is extremely bent , wire cannot be smoothly fed , the current is reduced , and thus the set welding conditions may be altered. To prevent this , place conduit as straight as possible.

(3) If welding is done at a current exceeding the rated output current , parts of the welder may be burnt. Allowable service factor for a current under the rated value is calculated as follows :

$$\text{Allowable service factor} = \text{Rated service factor} \times \left[\frac{\text{Rated current}}{\text{Operating current}} \right]^2 \%$$

Table5-1 Admissible duty cycle

Welding current (S350/S500)	Allowable service factor	Allowable continuous welding time	Welding pause time
350A/500A	60%	6 minutes or less	4 minutes or more
320A/460A	70%	7 minutes or less	3 minutes or more
300A/430A	80%	8 minutes or less	2 minutes or more
280A/400A	90%	9 minutes or less	1 minutes or more
270A/380A or less	100%	Continuous welding possible	—————

(4) Operation of power switch

The inverter welder adopts forced air cooling system. Turn off the power switch 2 or 3 minutes after welding is completed , not immediately after work. However, do not set up the wire feeder and torch cable when the power is on, as there is a danger of electric shock.

(5) Fan control

After turn on the power switch , the cooling fan stops within 5 minutes and turns again during welding operations. The fan stops within 15 minutes after terminate the welding operations , for reduce the dust collection.

(6) Stretch a protective curtain for workers and others to protect from arc light, spatter, and slag.

(7) Installation environment

Welding should preferably be done on a concrete floor. Damp ground or a metal floor should be avoided to prevent electric shock accidents. Objects that readily catch fire must be kept away.

(8) This welder is not applicable to gouging work.

(9) Radio interference

Noise may occur in radios during welding. Put radios far as possible from the welder. To use a radio without a battery but with 100VAC power supply , the 100VAC wire must be kept away from the welding torch.

6.SUPPORTED FUNCTION

6.1 Terminals and option connector

The MOTOWELD has some useful input and output terminals.

(1) External ammeter and voltmeter

The MOTOWELD has terminals for analog external ammeter and voltmeter internal welder.

Ammeter terminal : 400A-60mV shunt output

Voltmeter terminal : Welding voltage direct output

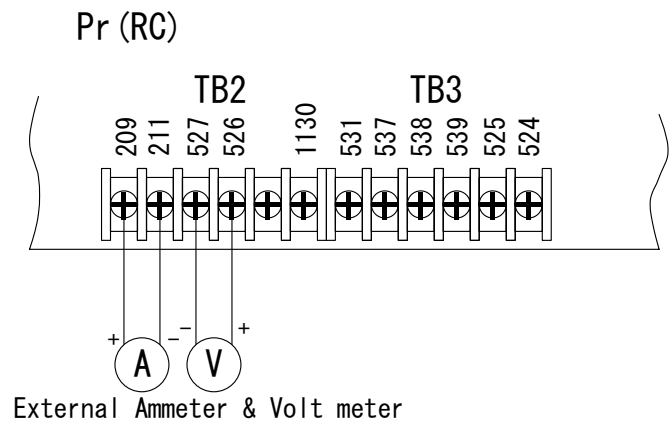


Fig 6-1 terminals for external meters

(2) External control of Gas check & “STC” select

The MOTOWELD has signal pins for external control in Robot I/F connector (CON 4).

Bellow controls can do from robot.

Controls	Signal pins	XRC Weld I/F cable	Open	Close	Front panel
Gas check	a – Z	“GAS” – “COM”	Valve close	Valve open	"NORMAL"
STC on/off	b - Z	“OP1” – “COM”	STC off	STC on	"STANDARD"

Table 6-1 pins for external controls

Notes: These pins are connected with each switches on the front panel in parallel.

If each devices select other side, welder work by “Close” side.

6.2 Internal switches

The switches selected about the following item is installed on the circuit boards. When shipping. The switches sets in the state of "Standard". Please select according to the condition used.

Setting of internal switches MOTOWELD-S350-AJ2 & JJE2

Board Name	SW Number	Standard	Explain	
Pr (MD 5)	SW1	S	S: YWE-WF310/340	L: YWE-WF310-A (Special)
	SW2	外	内 : Gas Valve is in welder	外:Gas valve is out of welder
Pr (MB 4)	SW3	ON	ON : Robot welder MOTOWELD	OFF:Other HITACHI welder
	SW4	OFF	No use	
	SW5	OFF	ON : Manual barn back adjustment	OFF:Auto barn back adjustment
	SW6	CP/CPL/P	No use	
	DSW1-1	OFF	ON : di/dt quick circuit active	OFF:None
	DSW1-2	OFF	DSW1-2 : OFF & DSW1-3 : ON di/dt auto adjustment	
	DSW1-3	ON	DSW1-2 : ON & DSW1-3 : OFF di/dt manual adjustment	
	DSW1-4	OFF	No use	
	VR55	2.5 k Ω (5th)	SW5:ON Active (Barn back voltage adjusting volume)	
	VR60	0 Ω (left 0)	DSW1-2 : ON & DSW1-3 : OFF Active (di/dt gain adjusting volume)	
Pr(CR-CAP3)	DSW3-1	OFF	No use	
	DSW3-4	OFF	No use	
	DSW3-5	ON	ON : Welding voltage feed foward	OFF : Welding voltage feed back
	DSW3-6	OFF	No use	
	DSW3-7	ON	ON : Pulse in barn back	OFF : STC in barn back
	DSW3-8	OFF	ON : Without wire slow down start	OFF : Use wire slow down start
	DSW4-1	OFF	No use	
	DSW4-4	OFF	No use	
	DSW4-5	OFF	ON : Gas pre-flow 0.4sec	ON : Use internal pre-flow time
	DSW4-6	OFF	No use	
	DSW4-8	OFF	No use	
	DSW8-1	ON	No use	
	DSW8-2	OFF	No use	
	DSW8-7	OFF	No use	
	DSW8-8	OFF	ON : Internal current detect is live	OFF : Use off delay for filter
Pr(PS2)	SW1 (Only "-AJ2")	200V	AC 200V input ●  (SW1 left) AC 220V input ●  (SW1 Right)	

Note: Never change setting of "No use" switch.

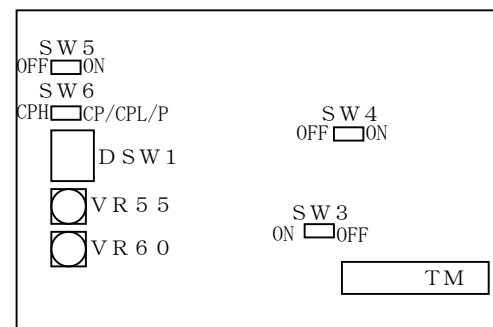
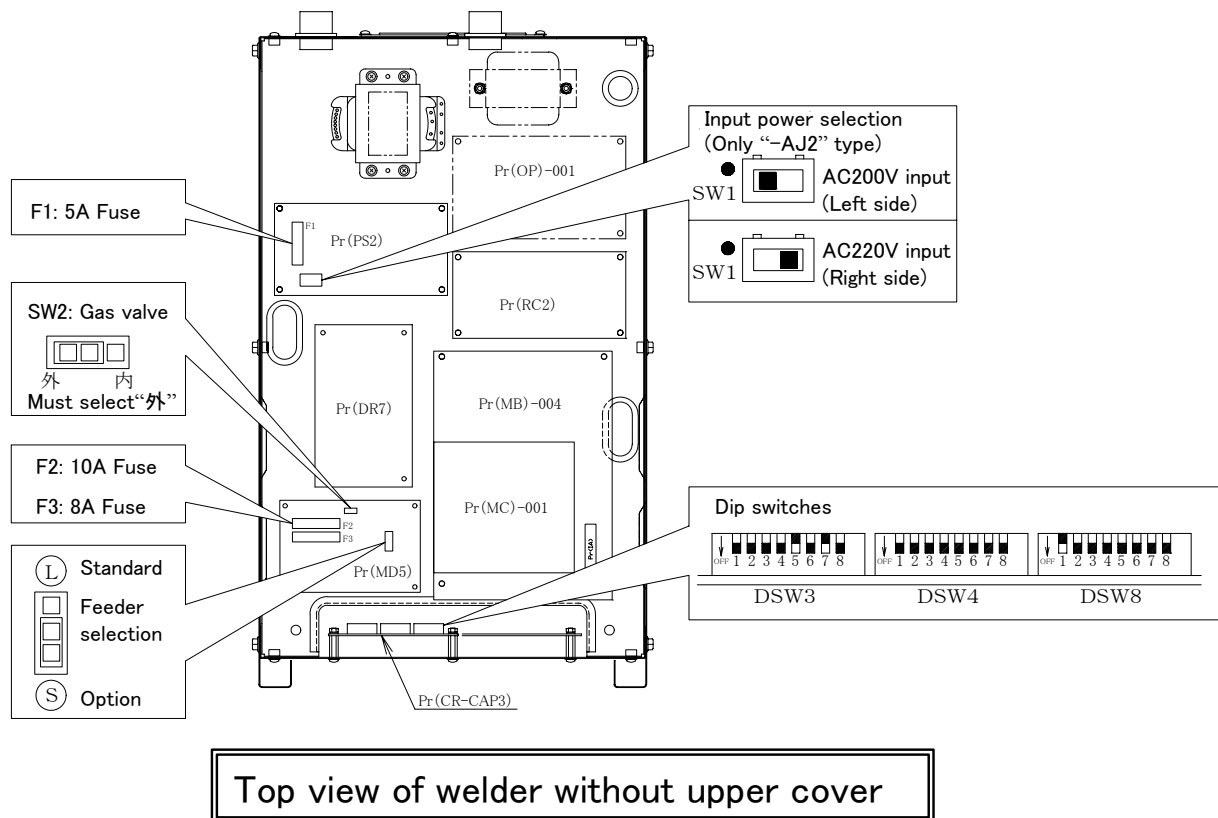


Fig6-2 Switch map on Pr(MB4)

6.3 Arrangement of circuit board



[Method of selecting switch]

The select switch of the shape shown in Figure 6-4 is installed in the circuit board. Please select the switch according to Figure 6-4.

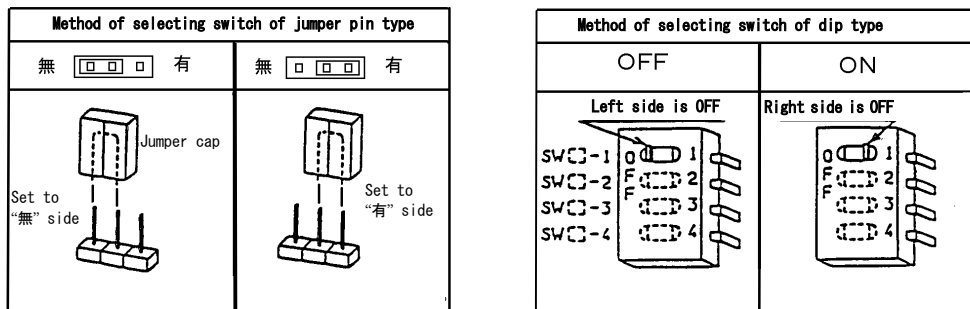


Figure 6-4 Method of selecting switch

7.MAINTENANCE AND INSPECTION

For safe and efficient operation of the welder , periodic maintenance and inspection are essential. Before checking internal or external pins , be sure to turn off the switch of the input side power distribution panel. For an internal check after use , wait for five minutes after turning off power , then remove the cover and check inside. This is because the capacitors in the power supply unit may be charged immediately after operation.

Table 7-1 Maintenance and inspection items

Daily check items	Inspection items for every 3 or 6 months
(1) Do switches function properly? (2) Does the cooling fan rotate smoothly according to the on/off state of the power switch? Is air driven out from behind the fan? (3) Is there any abnormal vibration , humming noise , or fume? Is there any gas leak? (4) Are the cable junctions abnormally heated up? (5) Are the welding cable and junctions abnormally heated up? (6) Is there any flow on the connection cable? Is there any incomplete insulation? (7) Is there any junction loosened?	(1) Removing dust Blow dry compressed air against the internal parts of the welder to remove dust. Clean semiconductors and clearances between transformers and reactors with special care. (2) Checking electrical connections Check junctions between input or output pin and external wiring and junctions between internal wires , to see if any fastening bolt is loosened or rusted and contact becomes incomplete. Tighten the loosened bolt , and remove rust by using a file. Be sure that metal face are in good contact. (3) Grounding wire Confirm that the case is properly grounded.
Yearly total fixing	
Total repairing includes replacement of defective parts , fixing the case , and enhancement of deteriorated insulation. Procure and replace defective parts found in monthly inspection. Insulation resistance must be 1MΩ or greater between the controller circuits and the case. When the resistance is found to fall short of this value , insulation must be reinforced or repaired.	
Parts life of welding power supply	
The welding power supply is composed of many parts. If those parts do not work precisely, they cannot perform their original functions. Check regularly for any sign of trouble and repair it immediately. Also, these parts are not intended for indefinite use. Even if using them under ideal conditions, characteristics can change and diminished performance occurs as the service life gets longer. To ensure complete efficiency of the welding power supply, it is recommended that the parts be changed regularly. They generally should be changed in accordance with the rated specifications. (8 hours/day, 250 days/year) Please see the following:	
1. electrolytic condenser	5 years
2. cooling fan	5 years
3. breaker, relay, etc.	depends on frequency of use
It is recommended to change to a new one about every 5 years.	

8.TROUBLESHOOTING

Before starting troubleshooting , perform the check listed in Table 8-1 , and check junctions between the metal receptacle and the cable and at the PC board connector to see if contact is complete. If the equipment does not function properly even after the above check , contact to the nearest service station to investigate the cause and to repair as soon as possible.

Table 8-1. Cause of anomalies in welder and action to be taken

State of anomaly	Cause	Countermeasures
Blow holes or pits occur.	Oil , rust , or paint adheres to the welded object.	Remove the attaching matter with care. Clean the welded area.
	Wire is covered with oil or rust.	Store and handle wire with care. Remove oil or rust from inside the feeder roller and conduit.
	Gas discharge is insufficient.	Check for a gas leak , confirm adjustment of the gas regulator , and check if the cylinder is empty.
	Gas shielding is ineffective because of wind blowing against the welded part.	Stop welding when wind blows hard. Or , take appropriate protection such as a shield.
	Spatter adheres to the nozzle , and hinders gas discharge.	Remove spatter off the nozzle frequently. Apply anti-spatter compound inside the nozzle.
	Gas quality is not good.	Use high quality gas.
	Arc point is too far from the nozzle.	Observe the proper wire extension (10mm to 25mm) for welding. Increase gas flow.
Arc is unstable	Power voltage fluctuations are large.	Use a power supply not connected to the machine that cause voltage fluctuation , or increase the capacity of the power supply transformer.
	The tip is worn out and the hole became larger.	Replace the tip. (Specified tip must be used.)
	Wire feed is sluggish.	Remove dust and iron powder clogging in the feed roller and conduit. Check if the conduit is bent extremely , and confirm that the liner , tip , and the feed roller are all fit for the wire diameter.
	Phase voltages of the three-phase power supply are not balanced.	Use a power supply not connected to the machine that causes voltage unbalance , or increase the capacity of the power supply transformer.
	Welding conditions are not proper.	Adjust the current and voltage with test arc.
	This anomaly occurs frequently when sheet is welded at a low current with CO2 gas only.	1)Change the extension shorter. 2)Set "STC"mode. 3)Use CO2 and argon mixed gas. ("STC"mode is off)
	Junctions are loosened.	Check junctions at pins or at welded object , and tighten them.
	Oxide ,slag ,oil and mist are on the surface.	Remove oxide, slag ,oil and mist on the surface.
	Arc-blow occurs.	1)Change the position of ground. (Change the direction of current) 2)Change the welding order, direction or working place. 3)Change the material of jig. (Check magnetic of jig)

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