MOTOWELD-S500

INSTRUCTIONS

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

YASKAWA

No. HW9482703

CONTENTS

This manual explains MOTOWELD-S500 operation and how to use them.

Please read this manual carefully and be sure to understand the contents before handling the MOTOWELD-S500.

1.CONFIGURATION AND SPECIFICATION

Rated Specifications

Ratings for power supply Unit and welder		YWE-S500-[ ]			
		AJ	2E	3E	4E
Rated input voltage and number of phases	[V]	200 or 220	380	415	440
		±10% , three-phase			
Rated frequency	[Hz]	50/60			
Rated input	[kVA]	27.5			
	[Kw]	24.3			
Welding current adjustment range	[A]	50-500			
Welding voltage adjustment range	[V]	16-42			
Rated duty cycle	[%]	60			
Wire feed speed	[m/min]	Wire size switch [ϕ1.2]side :2-15.5 [ϕ1.4]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			
Voltage of search function	[V]	280±20%			
Dimensions Weight（W×D×H）	[mm]	300（W）×635(D)×557(H)			
	[kg]	Approximately46			
Standard accessories	Fuse contained in glass tube 1A, 3A, 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 14mm^2 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(AJ -Switch type), 380V(2E), 415V(3E), 440V(4E).The welder supports a voltage compensation circuit so that the equipment can operate at a power voltage within ±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 no 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)	30
Fuse capacity (A)	100 or greater
Input cable (mm^2)	14 or greater
Output cable (mm^2)	60 or greater*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 or MAG 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.

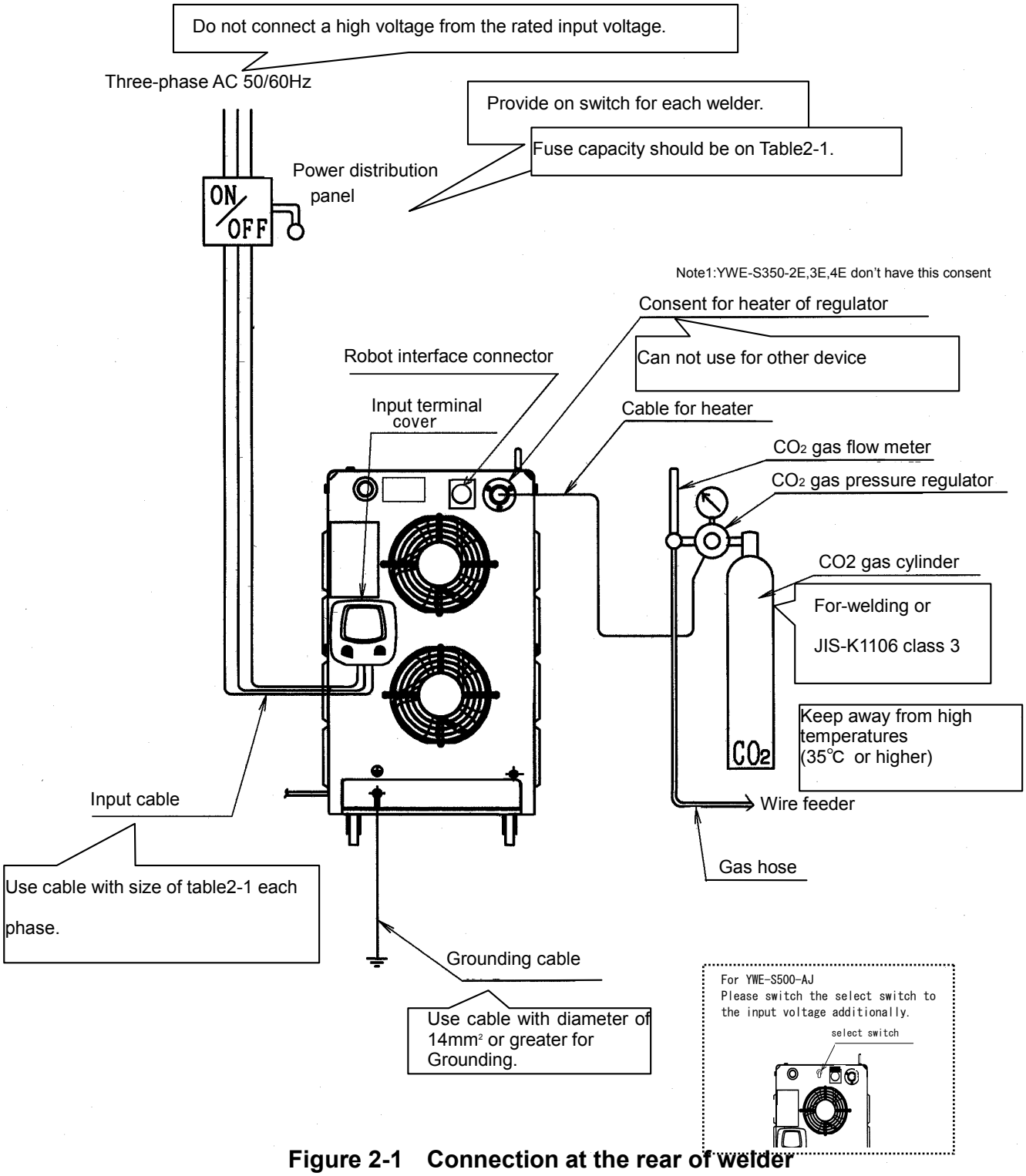


Figure 2-1 Connection at the rear of welder

The main switch on the power distributor panel must be turned off before wiring.

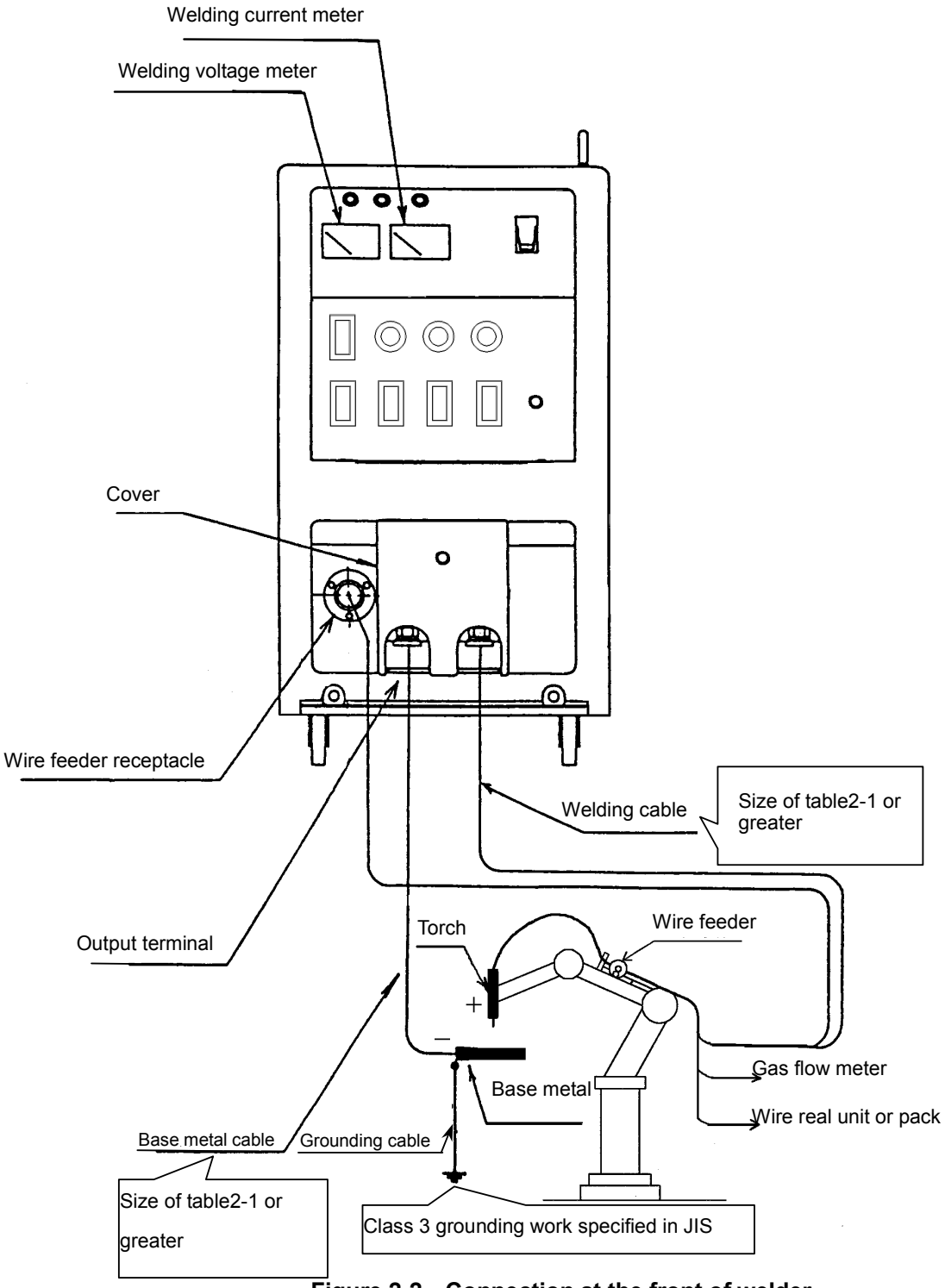


Figure 2-2 Connection at the front of welder

The main switch on the power distributor panel must be turned off before wiring.

(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 Connecting Gas System

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) Insert the consent for heater of the gas pressure regulator to the consent for heater on the back panel of the welder. This consent is only for the heater. Please do not use the consent for other purposes.

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.

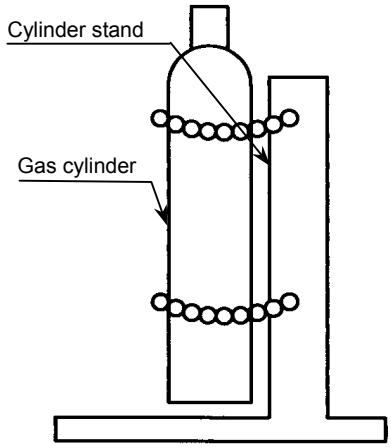


Fig2-3 Fixing the gas cylinder to keep it from falling

(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.

(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 **CO_2 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

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.

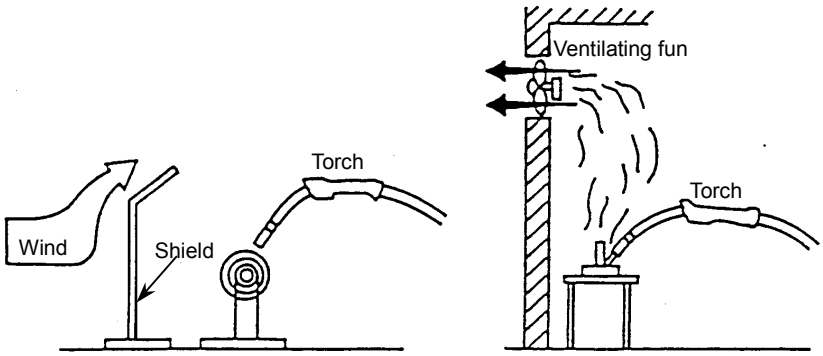


Fig.2-4 Shielding wind for welding Fig.2-5 Example of ventilation

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 there protectors.

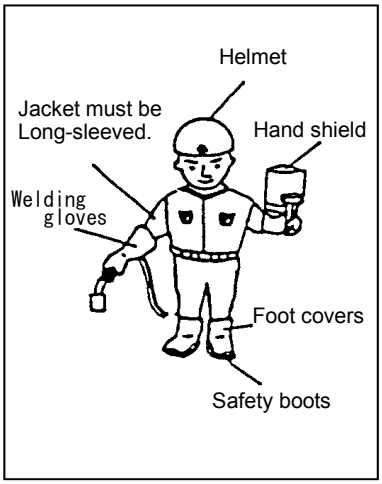


Figure 2-6

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 “VOLTAGE CONTROL TYPE”, “WIRE DIA.” and “WELD TYPE” on the panel of welder.
9	End	

4.WELDING OPERATION

4.1 Operation of front panel

Change switches of panel without welding them.

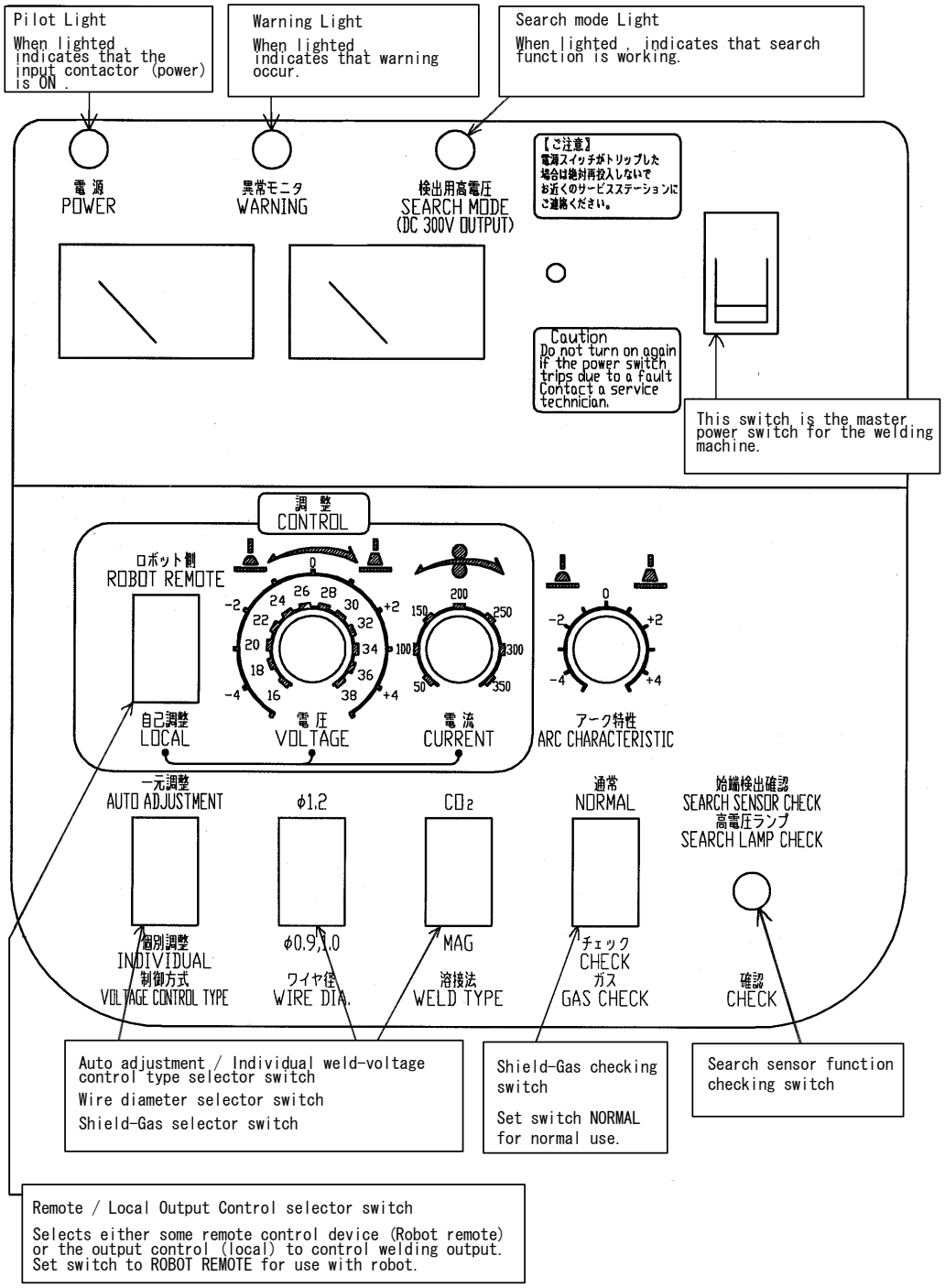


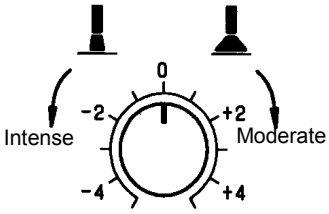
Figure 4-1 Operation of front panel

［Arc characteristic control］

Just set the ARC CHARACTERISTIC knob to “0”. Further fine adjustment to meet the following welding conditions is possible.

Intense side

-High speed welding
-Thick plate welding
-Down hand welding
-Large current welding
-MAG welding



ARC CHARACTERISTIC

Moderate side

-Wire with a diameter of 0.9mm or 1.0mm is used.
-Low speed welding
-Sheet welding
-Vertical up welding, overhead welding
-Minor current welding

Figure 4-2 Arc characteristic control

4.2 Adjustment for Welding Current and Voltage

In order to adjust the welding current and welding voltage, use the robot controller to setup the current and voltage instruction. When performing maintenance, be sure to keep a safe distance from the controller. Select to the “LOCAL” select switch on the panel in order to adjust the voltage and current. However, please confirm an accurate value with the meter because the value of the graduation of the panel is a standard.

(1) Auto Adjustment Control

Change the control switch on the panel from “INDIVIDUAL” to “AUTO ADJUSTMENT”. By adjusting only the welding current instruction, the welding voltage will also be adjusted automatically. When adjusting the welding voltage, check the arc conditions and move the dial lower or higher with reference to the datum point.

Caution) The adjustment of current and voltage using self control

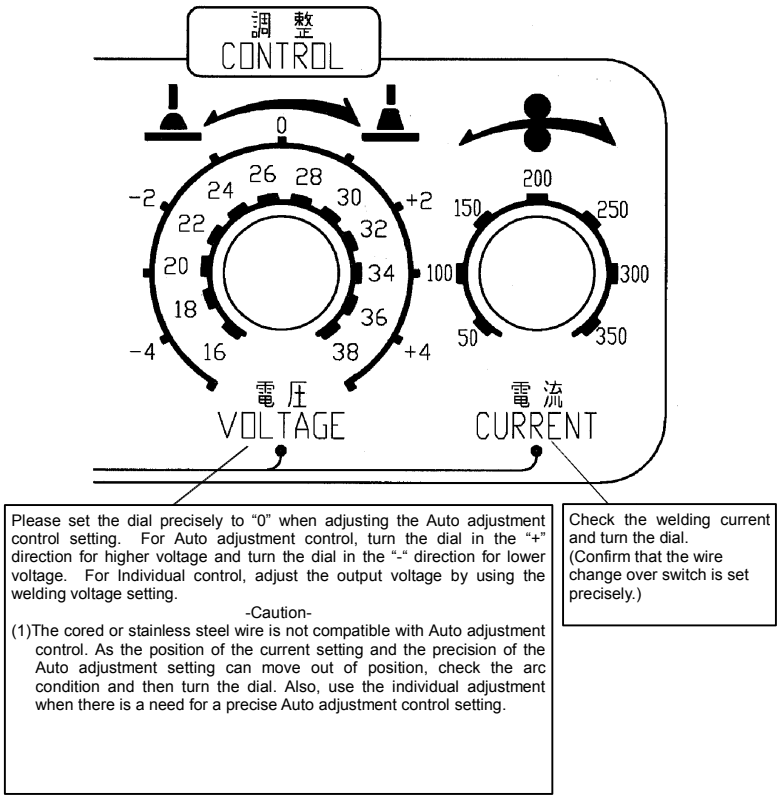


Figure 4-3 Adjustment for Welding Current and Voltage by “LOCAL”

(2) For Individual control

Set the control system from “AUTO ADJUSTMENT” to “INDIVIDUAL”. Welding current and voltage can then be controlled individually.

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.

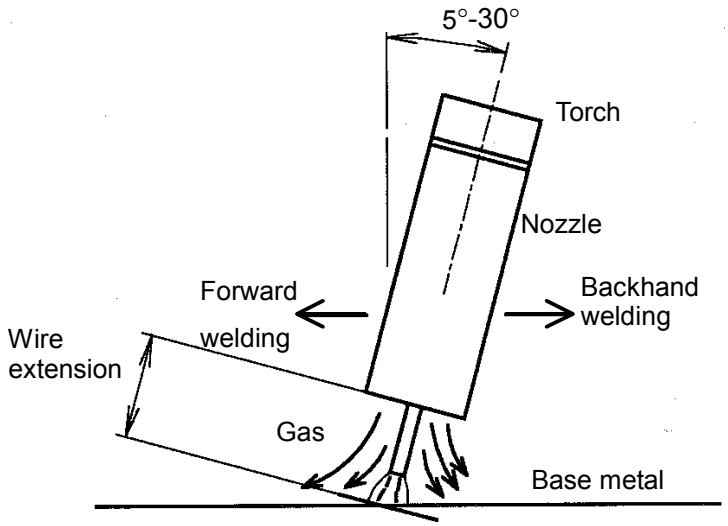
The wire extension is :

15mm for wire diameter ϕ 1.2

18mm for wire diameter ϕ1.4

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.



Forward welding is preferred in robot arc welding.

Fig.4-4 Direction of Weldingand 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.

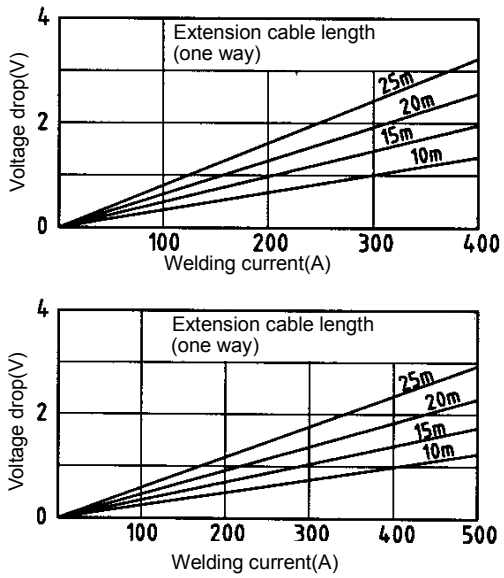


Figure 4-5 Measure of voltage drop along extension cable

This graph indicates the relationship between voltage drop and welding current when an extension cable of **60mm^2** 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 **80mm^2** 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

When the warning monitor lamp lights, the welding power supply is cut off automatically. At that time, please see the table below.

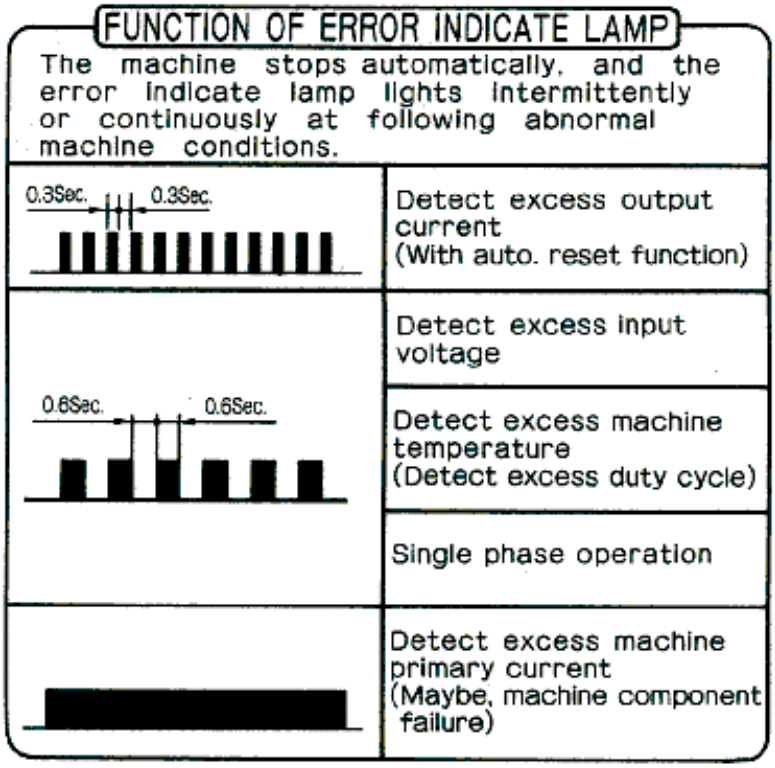


figure 5-1 Display of warning lamp

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 of MOTOWELD-S500

Welding current	Allowable service factor	Allowable continuous welding time	Welding pause time
500A	60%	6 minutes or less	4 minutes or more
460A	70%	7 minutes or less	3 minutes or more
430A	80%	8 minutes or less	2 minutes or more
400A	90%	9 minutes or less	1 minutes or more
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 for ARC ON input for maintenance check

The terminals are provided on the PC board (MB) that can be seen on the top when the cover is removed. Use a twisted wire for wiring at these terminals.

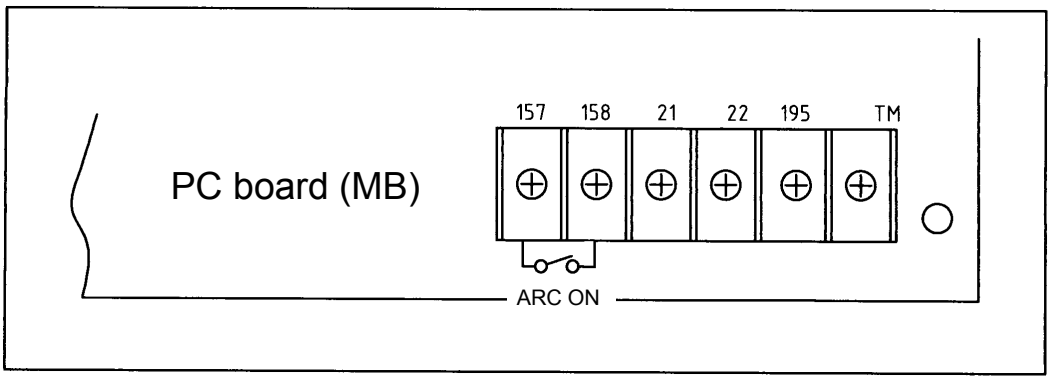


Figure 6-1 Terminals for Automatic Machine

When conducting the maintenance check on the welding power supply, the “Arc Start” terminal must be used to perform the single purpose test of operation. Improper use can cause the welding voltage to be impressed and distributed to the wire. This is unrelated to robot movement and may cause an accident.

Method of Use:

When the contact is close(=ON) with the switch or relay between 157 and 158, ARC starts without a robot controller command. When the contact is open(=OFF) and the robot controller doesn’t output “ARC ON” command to welder , ARC stops.

6.2 Internal select 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.

Table 6-1 Internal select switches

PC board	SW No.	Standard	Means	
Pr(MD)	SW1	S	Not used	
	SW2	S	Not used	
Pr(MB)	SW1-1	OFF	Not used	
	1-2	OFF	Not used	
	1-3	OFF	Not used	
	1-4	OFF	Not used	
	1-5	OFF	Not used	
	1-6	ON	ON:Anti wire stick time 2.0 S	
	1-7	OFF	ON:Gas pre flow 0.4 S	OFF:0.35 S
	1-8	OFF	ON:Wire slow down OFF	OFF:0.56 mS OFF:Wire slow down ON
	SW2-1	OFF	Not used	
	2-2	ON	Not used	
	2-3	OFF	Not used	
	2-4	OFF	Not used	
	SW3	ON	Not used	
	SW4-1	OFF	Not used	
	4-2	OFF	Not used	
	:	:	Not used	
	4-8	OFF	Not used	
	SW5	ON	Not used	
Pr(STC)	SW2	OFF	Not used	

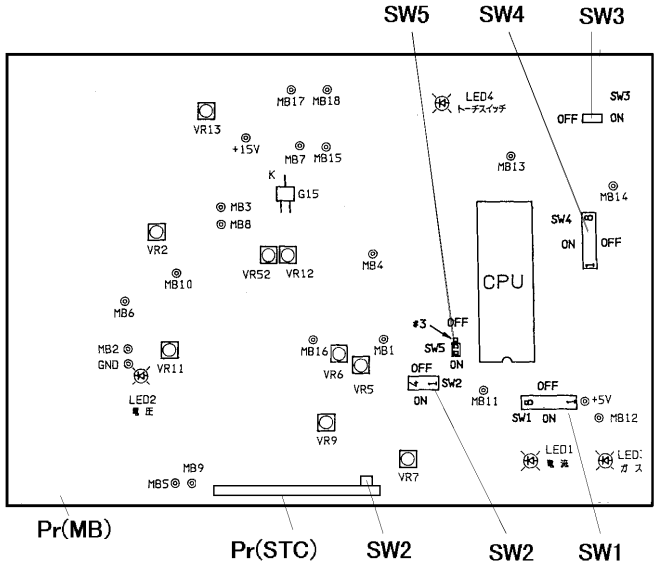
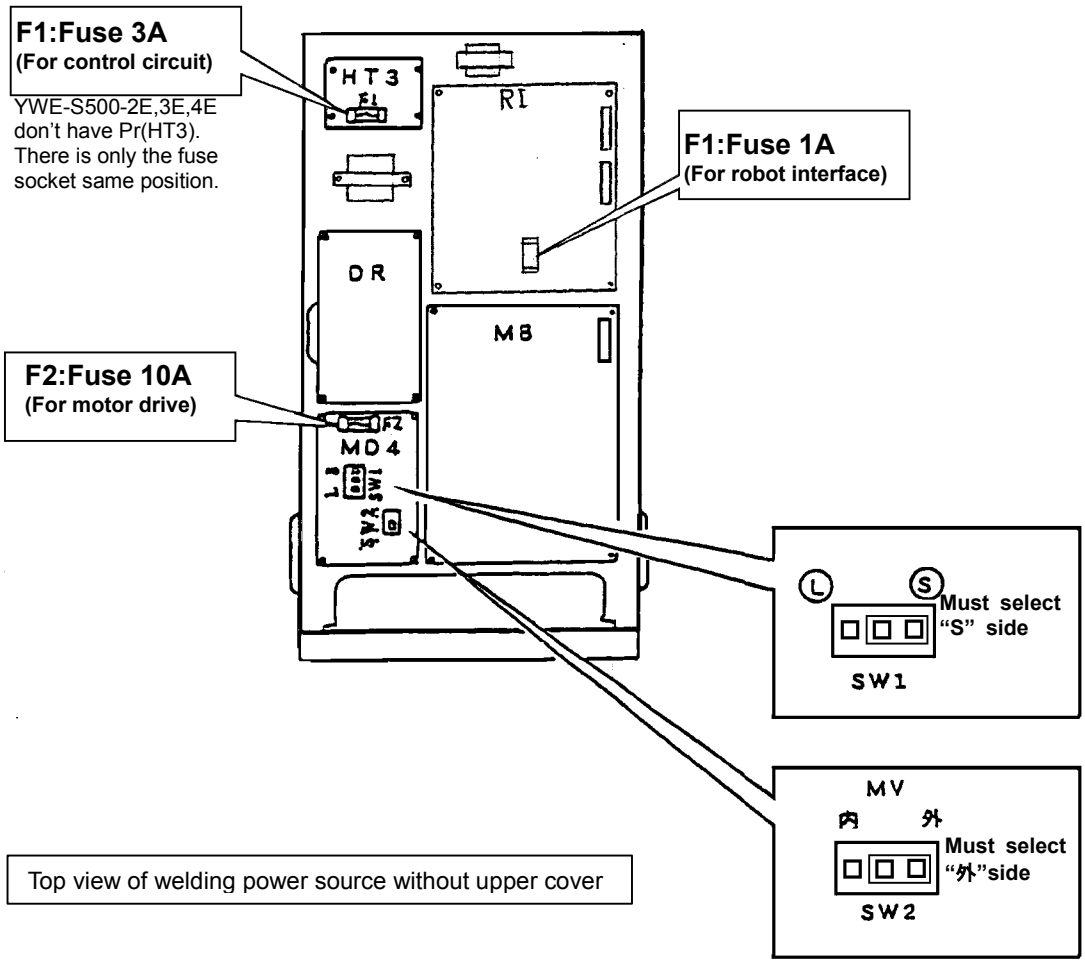


Figure 6-2 Arrangement of switch

[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.

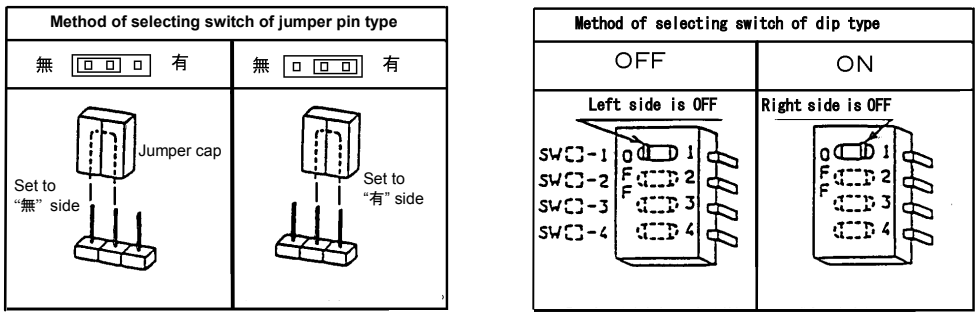


Figure 6-4 Method of selecting switch