USER'S MANUAL

HYUNDAI WELDING

Hi400i(D)

In order to apply this welding machine and use it safely, be sure to read and fully understand this manual before use, inspection, or repair.

HYUNDAI WELDING

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1. Safety Precautions

▶ Before using the welding machine, be sure to read and understand 'Safety Precaution'.

▶ Please keep the Safety Precaution when you use the welding machine since it states important issues regarding the safety for users.

▶ In this manual, the degree of risk is classified into the following three classes for situations that may occur due to the inappropriate usage.

	HAZARD
	It indicates a situation in which, if used improperly, an imminent risk of death or serious injury to persons may arise.
※ Use the "HAZARD" lettering and the red triangle symbol.	

	WARNING
	It indicates a situation in which, if used improperly, a possibility of death or serious injury to persons may arise.
※ Use the "WARNING" lettering and the orange triangle symbol.	

	CAUTION
	It indicates a situation in which, if used improperly, a possibility that a person may suffer minor or moderate injuries, or where material damage may occur.
※ Use the "CAUTION" lettering and the yellow triangle symbol.	

※ Among the degrees of injury described in the table above, severe injuries mean blindness, burns (hot or cold), fractures, short-term or long-term aftereffect and poisoning that may occur even after hospital treatment.

※ For safety, the installation, operation, maintenance and repair of this equipment must be performed by a qualified person or a person who understands the welding machine well.

※ During the operation, everyone must observe the following, and in particular, children, the elderly, and others with poor judgment must not approach it.

※ Be sure to use the welding machine in a state where safety is guaranteed.

1. Safety Precautions

	HAZARD	**Electric shock may result in death.**
  	• Contact with welding parts may cause fatal shock or serious burns. • Be careful because the wire and the work piece are welded when the output of the welding machine is generated. • When the welding machine power source is on, do not touch the Input power and the welding machine internal circuit as it is welded. • When performing semi-automatic or automatic welding, the wire, wire reel, feeding roller, housing and all metal parts are welded and may cause electric shock if touched. • Please note that incorrect installation or improper grounding is dangerous. 1) Do not touch welded parts. 2) For the case of the welding power source, the jig electrically connected to the work piece, a qualified electrician should perform grounding work in accordance with laws and regulations. 3) For installation and maintenance, be sure to turn off the power on the input side of the switchgear switch and perform work after at least 5 minutes have elapsed. Since the voltage charged in the Internal capacitor may remain, proceed after confirming that all the charged voltages are discharged. 4) Use cables with sufficient capacity, and cables which are smaller than the rated size or with damaged sheath cannot be used. 5) Make sure to tighten the connection part of the Wire and insulate it before use. 6) Check the condition of the input and output cables regularly, at least once a day. Electrical shock due to breakdown of cable insulation can result in death. 7) Do not wrap or lean the cable on your body. 8) Use only equipment that is operating normally and do not use equipment that is being repaired or malfunctioning. 9) When welding, wear protective equipments such as protective clothes, protective shoes, hard hat, safety glasses, mask, and gloves. 10) Wear moisture-free, puncture-free insulated gloves. 11) Turn off the power to all devices when the welding machine is not in use. 12) Do not weld with the welding machine case open.	

1. Safety Precautions

	HAZARD	**Welding may cause fire and explosion.**
  	• Spatter during welding may cause fire or explosion. • Hot work piece immediately after welding can cause fire or burns. • Welding on airtight containers such as pipes, drums and tanks can cause an explosion. • Welding containers containing combustible materials such as gasoline can cause an explosion. • Incomplete contact in the current passage, such as incomplete connection of wires, can cause a fire due to heat generated by welding. 1) Clean the area before operation so that the splash spatter does not come into contact with combustible material. If flammable materials cannot be cleaned, cover them with a non-flammable shield. 2) Do not weld near combustible gas. 3) Immediately after welding, be careful not to allow hot work piece access to flammable materials. 4) Fire extinguishers should be installed near the welding workshop to prepare for any eventuality. 5) Do not weld closed containers such as pipes, drums and tanks containing gas inside. 6) Wear fire-resistant, flame-resistant work clothes (top and bottom), gloves, work shoes, face shield, and a hat. 7) Securely tighten and insulate the connections of the wires. 8) For welding of ceiling, floor, and wall, remove the flammable material behind the hidden surface.

	WARNING	**Welding fumes and gases are harmful to the human body, and the accumulation of gas can cause fatal damage and death to the human body.**
 	• Fumes and gases are generated during welding. Exposure to fumes and gases can cause fatal breathing difficulties, impairments, or death. 1) Shut off the gas valve that is not in use. 2) Always ventilate in an enclosed space and wear oxygenator and mask. Also, observe task managers in the vicinity. welding fumes and gases can cause death. 3) Head in the direction of no fume and do not drink as much fume as possible. 4) When working inside, install ventilation holes to ensure that fume and gas are discharged well before working. 5) If ventilation is insufficient, install the dust collector and auxiliary ventilation system.

1. Safety Precautions

	**WARNING**	**Electromagnetic fields can harm the operator's body.**
 	• Electromagnetic fields may affect pacemakers. 1) The worker should work away from the magnetic field. 2) The cardiac pacemaker wearer should not be close to the welding power source and the welding area. 3) If the cardiac pacemaker wearer goes near an arc, gouging or resistance welding machine, consult with your doctor. 4) Access and welding are possible only when there are procedures and methods instructed by the doctor in charge.	

	**WARNING**	**Explosive gas cylinders can cause severe human and property damage.**
	• Gas cylinders contain high pressure gas. Use with care as it may explode if damaged. 1) Protect the gas cylinder from arc, spatter, spark, flame, mechanical shock, and overheating. 2) When installing the gas cylinder, stand it upright and fix it with a string or band to prevent it from falling over. 3) Do not weld gas cylinders or do welding or cutting on gas cylinders. 4) Do not hang the torch on the gas cylinder or let the wire come into contact with the gas cylinder. 5) In order to use the shield gas properly, use a flowmeter, hose, etc. that are suitable for the gas. 6) When opening the valve of the gas cylinder, keep your face away from the discharge port. 7) When using a gas regulator, be sure to use a dedicated regulator and for a CO_2 regulator, be sure to connect the heater power source before use.	

1. Safety Precautions

	CAUTION	**Arc light can cause serious burns to your eyes and skin.**
	1) In the arc light generated during welding, ultraviolet rays and Infrared rays are generated, which damages the eyes and skin. 2) When you see welding work or welding, protect your eyes and face by wearing welding faces, safety glasses, and welding helmets with adequate shielding ability. (Refer to Table 1. Welding Current and Shading Level). 3) Use approved products for the welding surface and the protective glass attached to the welding helmet. 4) A light shielding film is installed around the welding work to protect the people around the arc light, and be careful not to see the arc light. 5) Spatter and scattering metal are generated during welding, slag removal, grinding, etc. which may cause burns or wounds to the face and body. 6) Use protective glasses to protect your eyes from spatters and slags. 7) Prepare for burns by using protective equipment such as welding leather gloves, long-sleeved clothing, leg protectors, and leather materials.	

Welding Current and Shading Level				
Welding Current	100A or less	100 - 200A	300 - 500A	500A or more
Shading Level	NO. 9, 10	NO. 11, 12	NO. 13, 14	NO. 15, 16

Table 1. Welding Current and Shading Level

	CAUTION	**Hot parts after welding can cause severe burns.**
	1) Do not touch the work piece or torch immediately after welding. Allow the work piece or torch to cool sufficiently before handling. 2) Do not touch beads or slags with your bare hands. 3) Allow the cooling time before continuing to use the torch or welding torch.	

1. Safety Precautions

	CAUTION	**Noise can cause hearing impairment.**
	1) Noise from some work and equipment can damage your hearing. 2) If the noise level is high, wear an approved ear protector.	

	CAUTION	**To ensure user's safety, improper use of the product is prohibited.**
☞ We are not responsible for any accidents that when the user arbitrarily changes the design, function, etc to the original welding machine, or uses it differently from the specified usage method such as the original function and rated specifications. ☞ Please note that places with warning labels are dangerous. ☞ Do not remove or paint on the warning label.		

▶ Additional Precautions for Installation, Operation and Maintenance

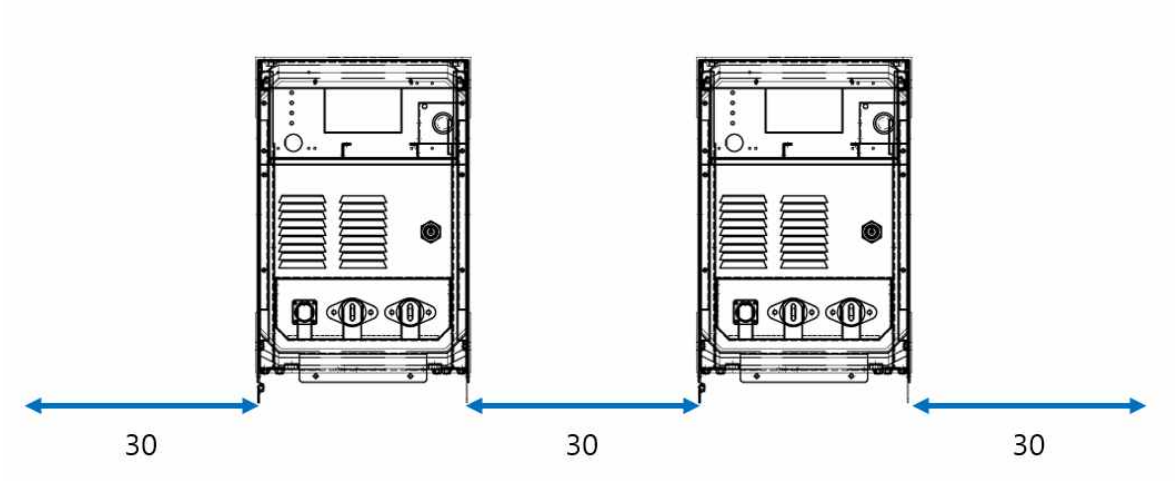
1) Welding machine should be installed and grounded according to this manual.
2) Do not install in and around flammable places.
3) For power source wiring, use a Wire or circuit breaker with a rating higher than the rated power and use it within the rated duty cycle.
4) Electromagnetic field energy can cause sensitive interference to electronic equipment such as computers and computer drive controls.
5) All equipment near the welding area must be electromagnetically compatible.
6) Keep the welding cable length as short as possible, tie it together, and make it as low as possible on the floor to minimize interference.
7) If electromagnetic interference continues, use shielded cables, line filters, etc. and measure as you move the position and install it in a suitable location.

2. Operating Precautions

For safe and correct use of the product, please read and understand the information below before using the welding machine.

▶ Place of Installation

1) Install the welding machine in a flat place without any dust or moist.
2) Install the welding machine in a place with adequate airflow, not in an enclosed space.
3) Avoid direct sunlight or rain and set the ambient temperature between −10°C and 40°C.
4) Do not install flammable objects where the welding machine is located.
5) Keep the welding machine at least 30cm from the wall when installing the welding machine.
6) When installing two or more welding machine side by side, maintain a distance of more than 30cm between the welding machines.
7) Use a gas cylinder for supplying the shielding gas, standing up and fixed to the holder.
8) Take measures against wind when there is the influence of wind during welding.



▶ Ventilation

During arc welding, the shielding gas is decomposed by the high temperature of the arc, and a small amount of carbon monoxide is generated. For working space of 30m² or less, be sure to install a ventilation system for the safety of workers.

▶ Protective Equipment

For worker's safety, be sure to wear proper work clothes and protective equipment.

2. Operating Precautions

▶ Product Movement

The welding machine is equipped with two eye-bolts for movement.

	CAUTION	**User may bump into a moving welding machine or the welding machine may fall and cause injury.**
   	• When moving or transporting, be sure to secure the welding machine on the transport device and move. 1) Be sure to disconnect the input power before moving the welding machine. 2) Separate the main body, wire feeder, cable, torch, etc. before moving the welding machine. 3) Before moving the welding machine, be sure to check the condition of moving tool. 4) The fall of equipment can seriously damage the human body and equipment. 5) When using a hoist, double check the safety and capacity of tools and equipment under load. 6) When using a hoist, human access is absolutely prohibited, and the user should adjust it where safety is ensured. 7) When moving with a forklift, move as low as possible, and make sure that no one is under the forklift when lifting or lowering the welding machine. 8) When moving with a forklift, move its hight as low as possible, unless it interferes with other objects. 9) Adjust the width of the forklift to match the width of the welding machine, so that there is no flow when moving.	

2. Operating Precautions

▶ Duty Cycle and Overheat

The duty cycle of welding machine is a percentage of the operating cycle of welding machine that can operate at a given to rated power. The cycle is calculated based on 10 minutes.

For example, if the duty cycle of a 400A welding machine is 60%, it can be used at the rated maximum output (400A, 34V) for 6 minutes welding in a 10-minute cycle and a 4 minute break.

	CAUTION	**Be sure to use the welding machine in accordance with the duty cycle.**

1) Excess of the duty cycle causes the temperature overload protection circuit to operate, and the overload circuit does not operate until the temperature inside the overheated welding machine is lowered to the proper temperature.
2) If an error is detected due to an overload (temperature) circuit, the power circuit of the welding machine will not operate. It is not a malfunction, so do not disconnect the power switch and wait until it cools down.
3) Excess of repeated duty cycle will shorten the damage and lifespan of welding equipment.

▶ When checking the welding machine

1) There is a part where high-voltage is applied inside the welding power source. Do not remove the enclosure for any purpose other than repair or inspection.

2) If internal inspection of the welding machine is necessary, turn off the power before inspection begins and work after at least 5 minutes or more. The internal capacitors may be charged with voltage. Thus, sufficient time is required before the charged voltage is discharged.

3. Product Configuration

▶ Standard Configuration of the product

Followings are the composition of this welding machine.

Basic Components

Item	Specification	Quantity
Welding power source	Hi400i	1
Wire feeder	RF-Hi400	1
Interface converter	Hi-COMM	1

Accessory Components

Item	Standard Specification	Quantity
Wire feeder mount bracket	Follow the specification of user's robot	1
Conduit cable	3M	1
Reel stand	WR-Hi400	1
Straightener	WR-Hi400	1
Robot torch	50SQ	1
Hi-COMM interface cable	6Pr*22AWG, 0.5m	1
Robot interface cable	10m	1
Control cable	8m	1
Sensing cable	PNCT 2C*1SQ, 5m	1
Output cable	WCT 50SQ, 8m	2

4. Product Rating and Installation

▶ Welding power source rated specification

Model	Hi400i
Rated input	18.6kVA
Rated input voltage, phase	3P, 220V / 380V / 440V
Rated frequency	50/60Hz
Rated output current	400A
Rated load voltage	34VDC
Welding current range	30A~ 400A
Welding voltage range	10 ~ 36VDC
Max. open circuit voltage	80V
Rated duty cycle	60%
Dimension (W*D*H)	316 * 532 * 620(mm)
Weight	45(Kg)
Process	LSM/DCM/PULSE

* Among the external dimension, (H) is the size excluding EYE BOLT. (There may be errors in the SIZE and WEIGHT)

▶ Power Source Equipment

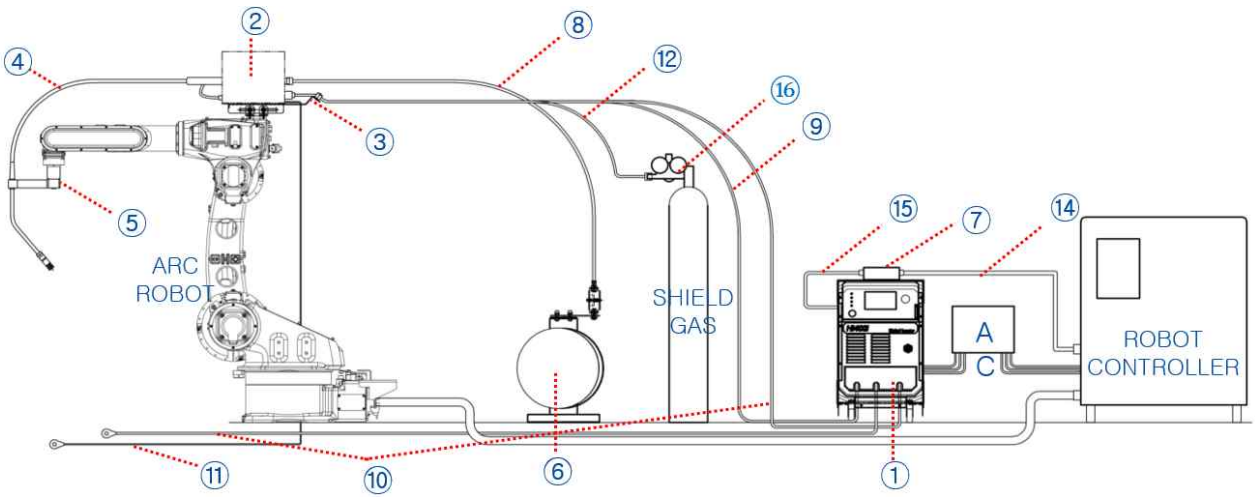
	**Hazard**	**Electric shock may result in death.**
	• The input power equipment (transformer, wiring breaker, fuse, cable) must be installed by a qualified electrician, and use the one that is suitable for the rated capacity. 1) When using an engine generator, use one that is three times or more the rated input of the welding machine. (KVA). 2) Install a circuit breaker per each welding power and use the specified capacity of the circuit breaker and fuse. 3) The allowable range of input power fluctuation of the welding machine is ±10% of the rated input voltage. 4) Even in the case of engine generator, factory self-generation power, or commercial power, normal output is not possible when the voltage waveform is distorted. 5) Do not use the input power with a noise load.	

4. Product Rating and Installation

▶ Connection

	HAZARD	**Electric shock may result in death.**
	• Before wiring the welding machine, be sure to turn off the power of the circuit protector. 1) Connect without gas leakage or poor contact of the conductive parts. 2) Be sure to insulate the conductive part where the bare wire is exposed using an insulating material.	

▶ Robot Type Wiring



No.	Item	Specification
1	Welding power source	Hi400i
2	Wire feeder	RF-Hi400
3	Wire feeder mount bracket	Depend on user's robot specifications
4	Torch	Depend on user specifications
5	Shock sensor	Depend on user's robot specifications
6	Wire reel stand	WR-Hi400
7	Interface converter	Hi-COMM
8	Conduit cable	Depend on user specifications
9	Communication cable	Welding Power-Wire Feeder
10	Output/Earth cable	WCT 50SQ 8m
11	Sensing cable	PNCT 2SQ 5m
12	Gas hose	8mm 10m
13	Interface converter	Hi-COMM
14	Communication cable	10m
15	Communication cable	Hi-COMM 0.5m
16	Gas regulator	-

4. Product Rating and Installation

▶ Input Power Connection

	HAZARD	**Electric shock may result in death.** **Welding may cause fire and explosion.**
	• Ensure that electrical qualified personnel works on input power connections and voltage changes. • Turn off the circuit breaker for input power before working. • If the cable does not satisfy the specification, the cable may be overheated and be damaged. • When contacting the damaged cable, electric shock may occur. Be sure to use the cable that satisfies specifications. 1) Always check the power source and voltage with a tester before or after connecting the power. 2) Grounding work stipulated by law must be carried out by qualified electricians. - Perform third class grounding work for the rated input voltage of 300V or less. - Perform special third grounding work for the rated input voltage of 300V or more. 3) Before connecting the power, be sure to read the nameplate and user manual of the welding power. 4) It's not the responsibility of ours in case of problems caused by not complying with the input power, method and capacity specified by the company.	

▶ Input Terminal

- 3□ 220V / 380V / 440V (50/60Hz), Input Spec: 18.6kVA
- Connect the input terminal which is attached to the back of welding machine and the 3-phase power.

4. Product Rating and Installation

▶ Output Cable Selection

	WARNING	**Electric shock may result in death.**
	• Use a cable sized for the rated power of the welding machine. • Please select and install the cable according to the information below. 1) Use cables as short as possible. And tie them together. – Do not use the cable length too short. It may cause overload. 2) Use an Insulation voltage of the welding cable that is greater than the no-load voltage (O.C.V) of the welding power. 3) Select the welding cable according to the maximum voltage of the welding machine and the cable length connected to the welding machine circuit. 4) Do not use damaged or worn cables. 5) This welding machine is 400A equipment and use 50SQ or more output cable. 6) Using insufficient rated cable may result in poor weldability and cable damaged. 7) Select the output cable referring to the table on page 18.	

▶ Output Terminal Connection

	WARNING	**Electric shock may result in death.**
	1) Check the symbol at the output panel of the welding machine and connect it according to the polarity of (+) and (−). 2) Fix the output terminal firmly and securely. 3) If the output terminals are loosely fixed, the contact parts may be heated. 4) Be sure to check the fixing state of output terminals before starting welding. 5) Insert the control cable to the end and fix it.	

4. Product Rating and Installation

▶ Output Cable Selection Table

Minimum Cross Section (mm²)	Rated Output Current(A)	
	60% Duty Cycle	100% Duty Cycle
10 or more	101	100
10 - 16	139	135
16 - 25	190	180
25 - 36	243	225
35 - 50	316	285
50 - 70	403	355

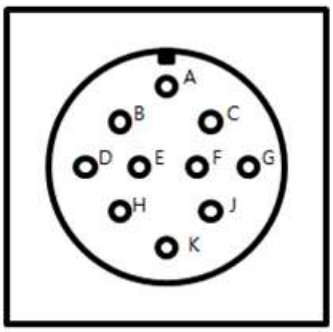
* The above table shows the cable size compared to the output current according to IEC 60974-12.

Length(m) Current(A)	20	30	40	50	60	70	80	90	100
100	38	38	38	38	38	38	38	50	50
150	38	38	38	38	50	50	60	80	80
200	38	38	38	50	60	80	80	100	100
250	38	38	50	60	80	80	100	125	125
300	38	50	60	80	100	100	125	125	
350	38	50	80	80	100	125			
400	38	60	80	100	125				

* The above table is a selection table according to the use of cap tyre cable. When using direct current, the voltage drop is 4(V) or less in cross-section (㎟). When using alternating current, use a larger size.

▶ Specification of Wire Feeder Control Connector

MS3102A- 18- 19P



PIN	Connection	PIN
A	48V	48V
B	N/C	-
C	V_FB(+)	Output voltage sensing cable
D	CAN_H	CAN communication line
E	WCR	WCR signal
F	MOTOR_STOP	Motor drive stop signal
G	V_FB(-)	Output voltage sensing line
H	CAN_L	CAN communication line
J	ISO_GND	GND
K	GND	GND

* Please refer to the '6. Product Maintenance' for interface-related connector specifications.

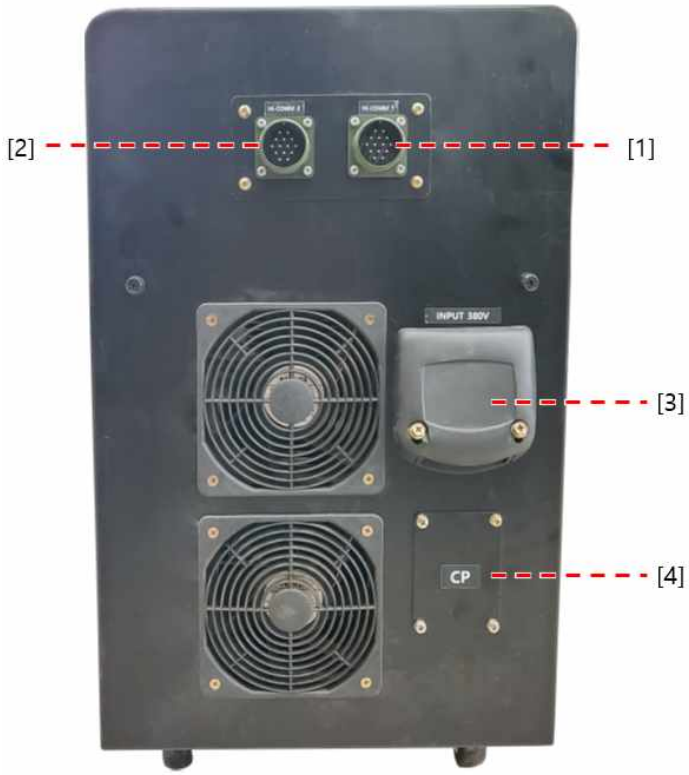
5. Operation and Function of Product

▶ Welding Power Source

[1] HMI : Adjust/display the control values/status of the welding machine.
[2] Power switch : Turns ON/OFF the power of the welding machine.
[3] Output terminal (+) : Wiring the output cable (to wire feeder).
[4] Output terminal (−) : Wiring the earth cable (to work piece).
[5] MS connector : Wiring the control cable of wire feeder.

5. Operation and Function of Product

▶ **Welding Machine Rear Panel**

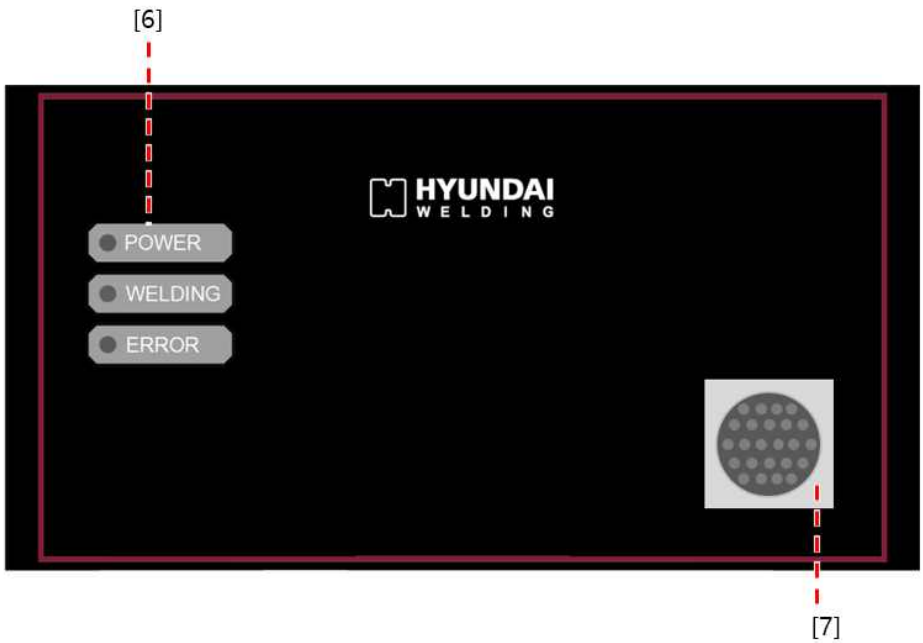


[1] MS connector1 : Connect Hi-COMM1.
[2] MS connector2 : Connect Hi-COMM2.
[3] Input terminal : Connect 3-phase power input cable.
[4] Circuit protector : Turn on/off the switch to supply main power to the welding machine and protect the circuit. (initialized status of the switch - on)

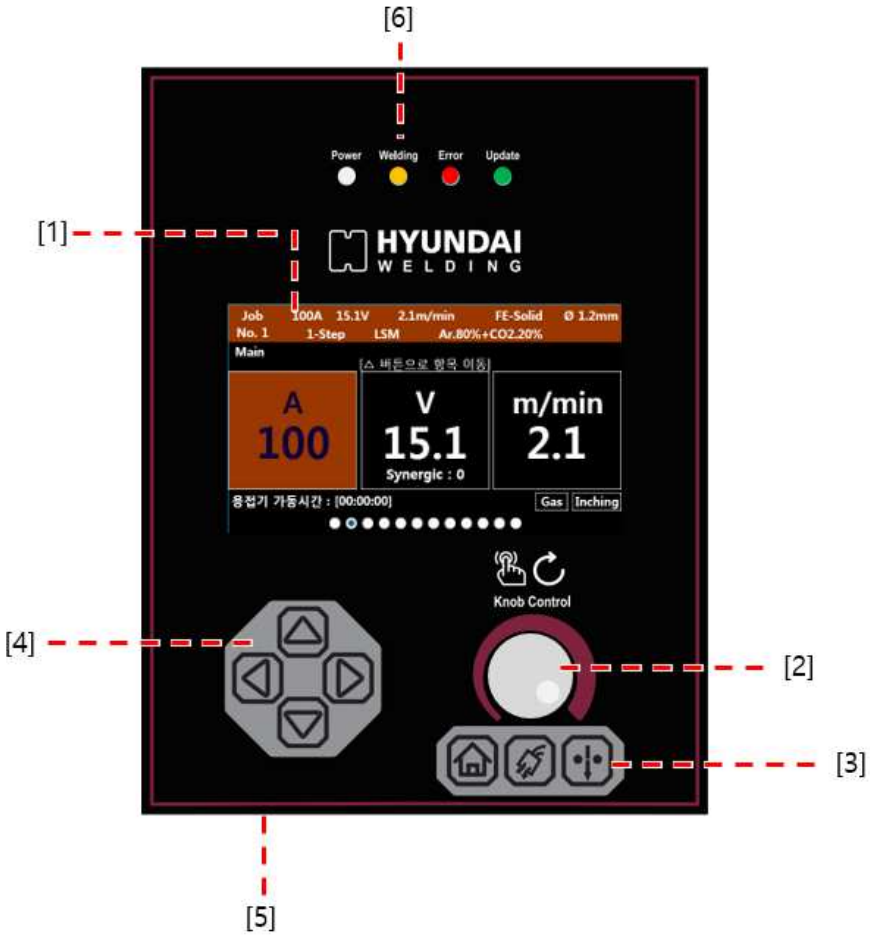
5. Operation and Function of Product

1. Configuration and Function of Display Panel

<Hi400i Display Panel>



<Hi400iD Display Panel>



<Hi400iD HMI Pendant>

[1] HMI : Display set / output / status values.

[2] Adjustment/Input KNOB : can change the set value / parameter by rotating the KNOB. It can enter or return (or save) into the setting value/parameter switching mode by adjusting the KNOB.

[3] Wire inching/gas switch : When the switch is operated, wire inching / gas purging operation is executed.

[4] Menu selection switch : When the switch is operated, screen / menu / setting value / parameter can be selected.

[5] USB port : Update the firmware of the PCB inside the welding power source using USB.

[6] Status indication LED : Display the status of welding power.

- POWER : Light on when welding machine is ON. (White)
- WELDING : Light on during welding. (Yellow)
- ERROR : Light on when error is detected. (Red)
- UPDATE : Flicker or light on when USB is connected to the USB port and the firmware is updated. (Green shows when update is completed and ready to remove USB)

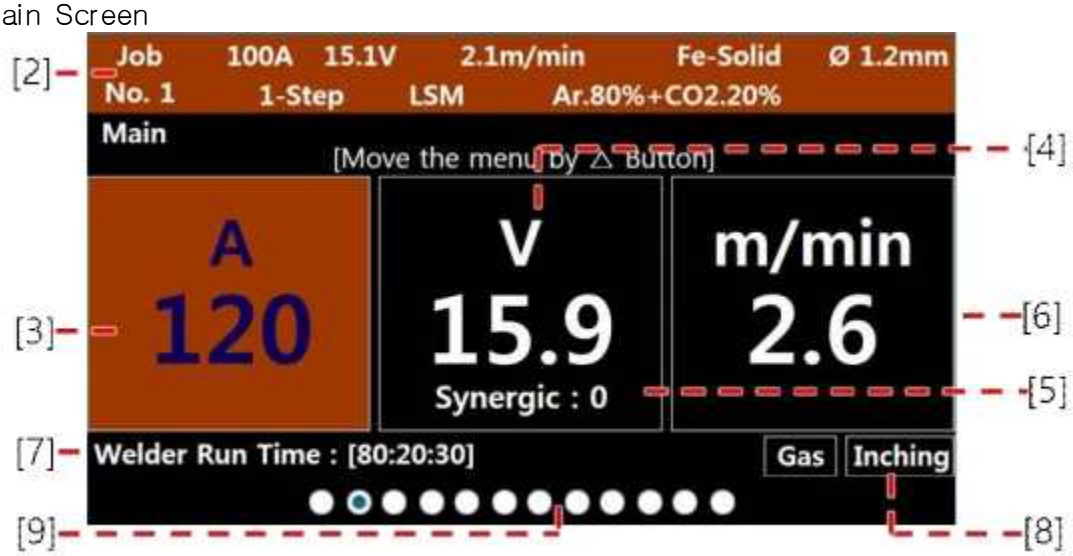
* For detailed operation of the status Indicator LED during USB UPDATE, refer to the '8. Troubleshooting and Inspection – 3. Product Firmware Update.'

2. Screen Configuration Function and Method to Set

1) System Booting Screen

[1] : The system booting starts when welding power source allows to turn on. When the booting starts, the progress bar that displays booting status increases. As progress bar is fully filled, booting is completed and basic setting screen is displayed.

2) Main Screen



[2] : Currently set welding conditions are displayed. Display Info – JOB No. welding current, welding voltage, wire feeding speed, wire material, wire diameter, operating mode, welding mode, and shielding gas in a selected JOB.

[3] : Display setting (standby) / output (on welding) welding current. When adjusting the [6] feeding rate after its selection, the setting value of the welding current by the pre-programmed welding database is displayed.

[4] : Display setting (standby) / output (on welding) welding voltage. When manual is selected, setting method of command voltage can be set. And when synergic is selected, the welding voltage set value is displayed according to the welding current / feeding speed and [5] synergic voltage setting ratio according to the pre-programmed welding database.

[5] : Display the ratio of set synergic voltage. Command voltage setting method can be set when synergic is selected.

[6] : Display the setting (standby) / output (on welding) feeding speed. When adjusting [3] the welding current after its selection, the setting value of feeding speed by the pre-programmed welding database is displayed.

[7] : Display the holding time of the welding power source on. Form [Hour : Min : Sec]

[8] : Display the operating status by operating gas and inching switches. During operation, the corresponding icon is highlighted.

[9] : Navigation point bar that places current screen out of entire menu screen.

* Available to select [3] welding current, [4] welding voltage, [6] feeding speed by operating

switch. Selected items's color and value can be changed by rotating the KNOB.

* The parameters and adjustable ranges that can be adjusted within the setting screen are listed in the table below.

Parameter [Unit]	Min.	Max.	Adjustment Unit
Welding Current [A]	30	400	1
Welding Voltage [V]	10.0	36.0	0.1
Synergic	-5.0	5.0	0.1
Feeding Speed [m/min]	0.9	18.0	0.1

3) JOB Selection Screen

[10] : Display the currently set Job No. The range of selectable Job No. is 1 to 100.

[11] : Welding conditions set in the selected Job can copy to other Jobs. Selection of the Job No. to copy is available.

[12] : Welding conditions set in the selected Job can be copied to other Jobs. The welding conditions of the Job selected in [11] can be copied and saved to this Job No.

[13] : After setting the conditions [11],[12] for copying and saving Jobs, select this to execute.

[14] : Welding conditions stored in all Job No. are initialized (factory default setting). When initializing settings, the values are changed as shown in the table at below.

5. Operation and Function of Product

Parameter [Unit]	Initial value	Parameter [Unit]	Initial value
Welding current [A]	200	**Welding voltage [V]**	Database setting value in accordance with welding current
Feeding speed [m/min]	Database setting value in accordance with welding current	**Synergic**	0.0
Wire material	FE-Solid	**Wire diameter [mm]**	□1.2
Operation mode	1T	**Welding mode**	LSM
Shielding gas	CO_2 100%	**Job No.**	Current setting value

* Menu items can be selected by operating  switch.
* In the selected menu, press the KNOB to enter the setting change mode, and adjust the KNOB to adjust and save the setting value. After setting, press the KNOB again to cancel the setting change mode. In menu [13],[14], the function is executed when it is released after entering it.

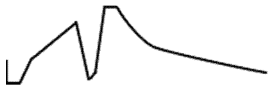
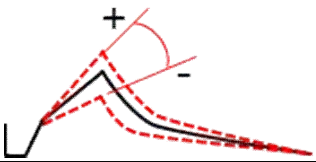
! Note: After entering the setting change mode, unavailable to select or move to other menus unless there is releasing of the change mode.

4) Job Setting Screen

[15] : Available to select welding mode.
[16] : Available to select wire diameter.
[17] : Available to select wire materials.
[18] : Available to select shielding gas.
[19] : Available to select command voltage setting method.
[20] : Available to change arc characteristic adjustment ratio. It displays initial value(0) and adjustable range at the right side of menu(-50 ~ 50)
[21] : Selection of welding setting without programming welding database([15],[16],[17],[18]) displays the 'no database' pop-up window, and welding is unavailable. Selection of the settings with welding database, the pop-up window disappears and welding can be performed.

5. Operation and Function of Product

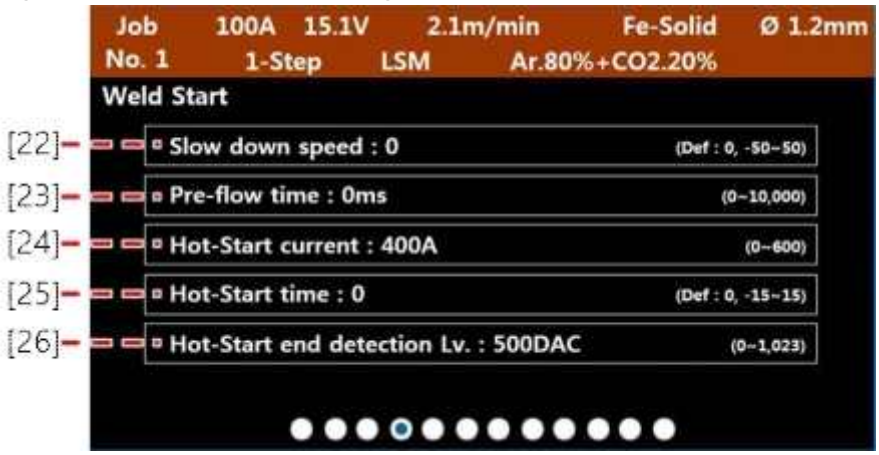
* Explanation of adjustable parameter and setting value in the Job setting screen are shown in the table at below.

Parameter [Unit]	Setting Value
Welding mode	1) LSM mode : Low spatter welding mode * Example of welding wave  2) DCM mode : General DC welding mode * Example of welding wave  3) PM mode: Pulse welding mode (mode will be added) 4) DPM mode: Double pulse welding mode (mode will be added)
Wire diameter [mm]	0.8, 0.9. 1.0, 1.2, 1.4, 1.6
Wire material	Fe-Solid, Fe-Cored, STS-Solid, STS-Cored, AL-Soft, AL_Hard, CuSi, CuMg, SP1, SP2
Shielding gas	1) CO_2 100% 2) Ar 80% + CO_2 100% 3) Ar 98% + CO_2 2% 4) Ar 100%
Voltage setting method	Manual, Synergic
Arc Characteristic	1) Adjustment range : -50 ~ 50 (Initial value : 0) 2) Adjustment unit : 1 * + : Hard arc, amount of Spatter↑, ease high-speed welding * 0 : Reference Value * - : Soft arc, amount of spatter ↓, ease low-speed welding 

* Menu items can be selected by operating  switch.
* In the selected menu, press the KNOB to enter the setting change mode, and rotate the KNOB to adjust the setting value. After setting, press the KNOB again to cancel the setting change mode.

! Note: After entering the setting change mode, unavailable to select or move to other menus unless there is releasing of the change mode.

5) Welding Start Parameters Setting Screen



[22] : Set the wire slow down feeding speed.
[23] : Set the shielding gas pre-flow time.
[24] : Set the HOT START current.
[25] : Set the HOT START time.
[26] : Set the HOT START ending detection level.

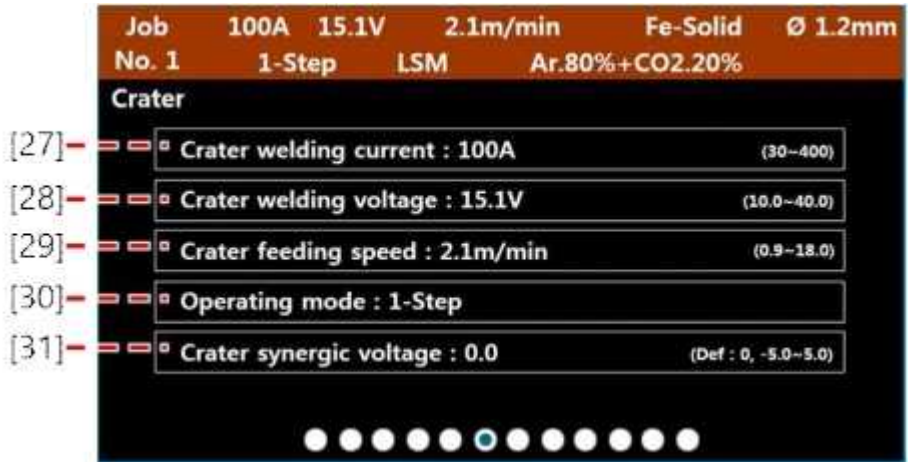
* Information on the setting value of the adjustable parameter within the welding start parameters setting screen are shown in the table at below.

Parameter [unit]	Initial	Min.	Max.	Adjustment unit
HOT-START current [A]	400	0	600	1
HOT-START time [ms]	0	-15	15	1
HOT-START ending detection level [DAC]	500	0	1,023	1
Wire slowdown feeding speed [m/min]	0	-50	50	1
Shielding gas pre-flow time [ms]	20	0	10,000	1

* Menu items can be selected by operating  switch.
  * In the selected menu, press the KNOB to enter the setting change mode, and rotate the KNOB to adjust the setting value. After setting, press the KNOB again to cancel the setting change mode.

! Note: After entering the setting change mode, unavailable to select or move to other menus unless there is releasing of the change mode.

6) Welding Crater Parameters Setting Screen



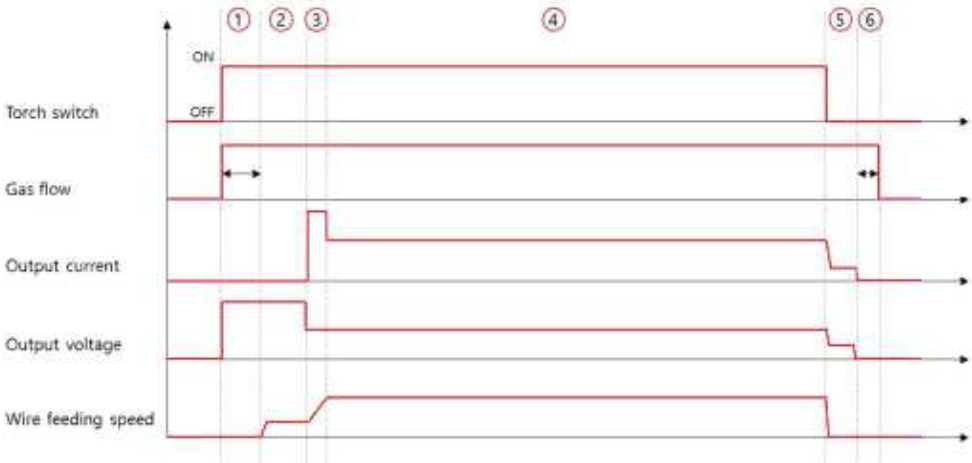
[27] : Set the crater welding current. Display the crater welding current by pre-programmed welding database when selecting and adjusting the crater feeding speed[29].

[28] : Set the crater welding voltage. When manual is selected, command voltage setting method can be set. When synergic is selected, display the setting value of crater welding voltage by pre-programmed welding data base according to the welding current/feeding speed and [31] crater synergic voltage setting ratio.

[29] : Set the crater feeding speed. Displays crater setting value of feeding speed by pre-programmed welding database when selecting and adjusting the crater welding current.

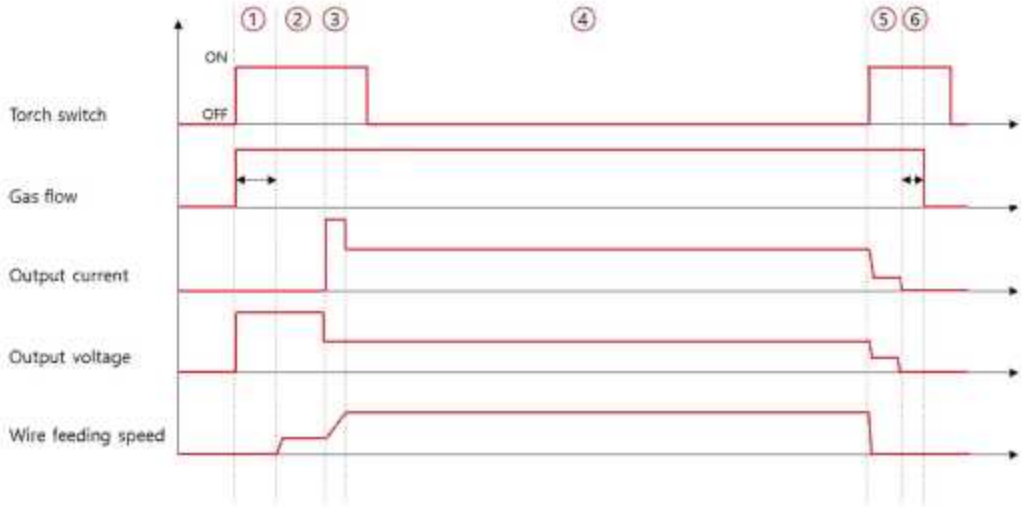
[30] : Select the operating mode. Operation sequence in accordance with operating mode is as follows.

* 1-Step



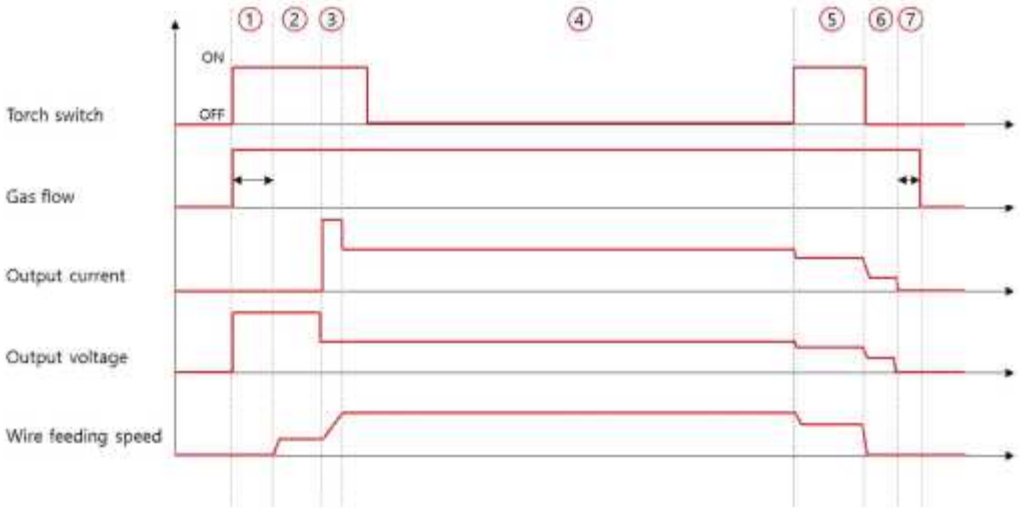
① Pre-flow time, ② No load output period, ③ start welding period, ④ Main welding period, ⑤ End welding period, ⑥ Post-flow time

* 2-Step



① Pre-flow time, ② No load output period, ③ Start welding period, ④ Main welding period, ⑤ Crater welding period, ⑥ End welding period, ⑦ Post-flow time

* 4-Step



① Pre-flow time, ② No load output period, ③ Start welding period, ④ Main welding period, ⑤ End welding period, ⑥ Post-flow time

[31] : Set the ratio of set crater welding synergic voltage. Command voltage setting method can be set when synergic is selected.

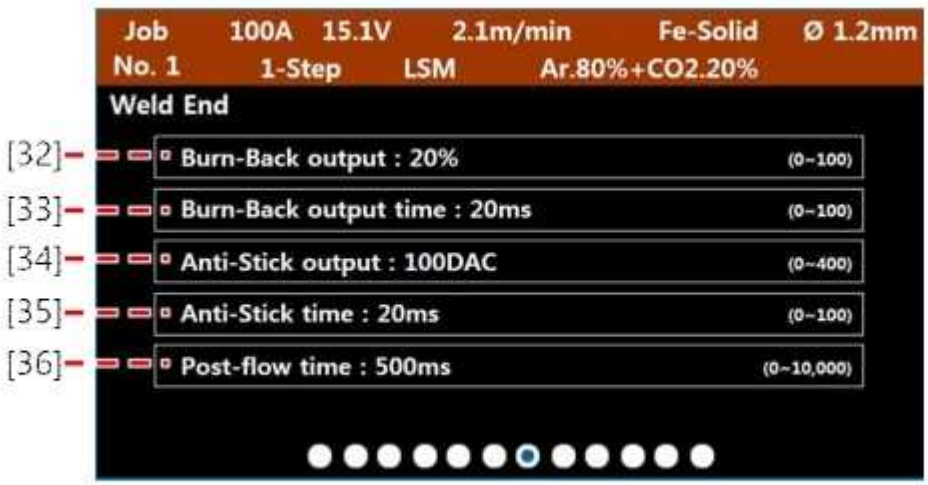
* The parameters and adjustment ranges that can be adjusted within the crater parameters setting screen are shown in the table below.

Parameter [Unit]	Min.	Max.	Adjustment Unit
Crater welding current [A]	30	400	1
Crater welding voltage[V] (Manual)	10.0	36.0	0.1
Crater feeding speed [m/min]	0.9	18.0	0.1
Operating mode	1-Step	4-Step	-
Crater synergic voltage	-5.0	5.0	0.1

* Menu items can be selected by operating  switch.
* In the selected menu, press the KNOB to enter the setting change mode, and rotate the KNOB to adjust the setting value. After setting, press the KNOB again to cancel the setting change mode.

! Note: After entering the setting change mode, unavailable to select or move to other menus unless there is releasing of the change mode.

7) Welding End Parameters Setting Screen



[32] : Adjust Burn-Back output size to adjust the size of the end of wire when welding is ended.
[33] : Adjust Burn-Back output time to adjust the size of the end of wire when welding is ended.
[34] : Adjust Ant-Stick output to release the fusion between the wire and the work piece after welding is ended.
[35] : Adjust Anti-Stick output time to release the fusion between the wire and the work piece after welding is ended.
[36] : Set the post-flow time.

5. Operation and Function of Product

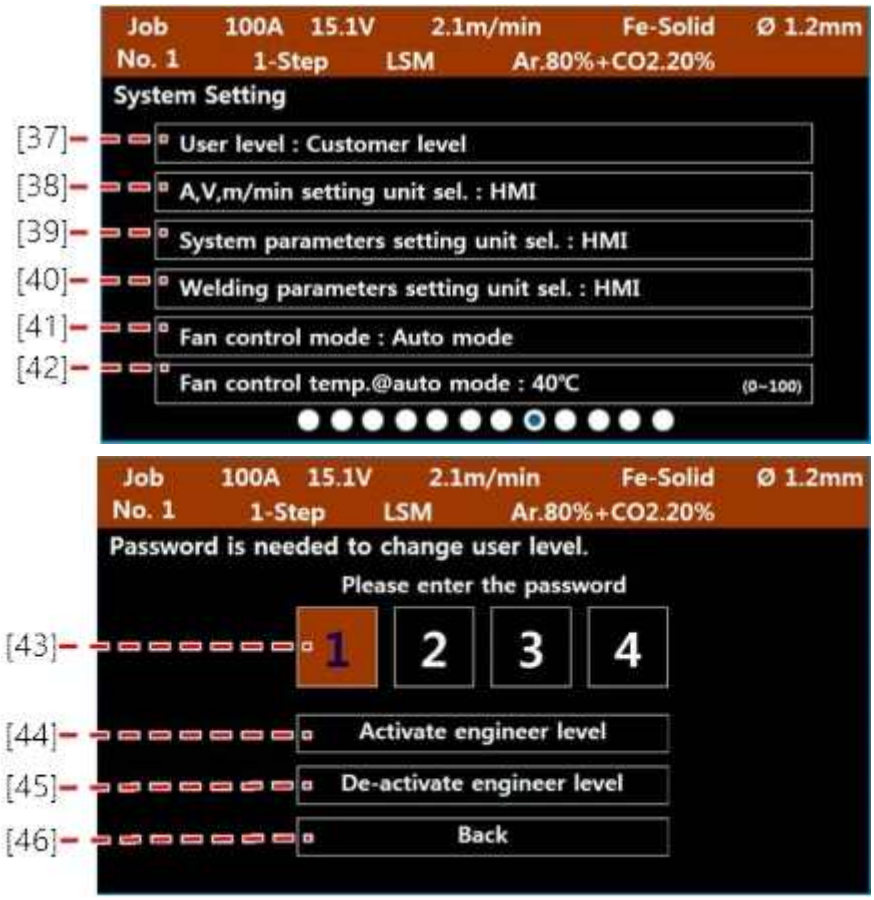
* Information on the setting value of the adjustable parameter within the welding end parameters setting screen are shown in the table at below.

Parameter [Unit]	Initial	Min.	Max.	Adjustment Unit
Burn- Back output [%]	20	0	100	1
Burn- Back output [ms]	20	0.0	200	1
Anti- Stick output voltage [DAC]	500	0	1,023	1
Anti- Stick output time [ms]	10	0.0	100	0.1
Post- flow Time [ms]	200	0	10,000	1

* Menu items can be selected by operating  switch.
  * In the selected menu, press the KNOB to enter the setting change mode, and rotate the KNOB to adjust the setting value. After setting, press the KNOB again to cancel the setting change mode.

! Note: After entering the setting change mode, unavailable to select or move to other menus unless there is releasing of the change mode.

8) System Setting Parameters Screen



[37] : Users authority of welding power source can be changed. According to users' authority, setting parameters screen of internal control parameters can be activated or non-activated. Changes in accordance with users' authority are as follows.

Users Authority	Initial Setting	Displayed Items
Customer Level	○	Detailed parameter setting inactive
Engineer level		Welding Start, End, Waveform Control detailed Parameter Setting Screen non-active * Information on detailed setting parameters is provided separately by the manufacturer

In order to change users authority (Engineer level), password is required. If you select Engineer Level in this menu and release the setting change mode, the [43] password input screen is activated.

After entering the 4-digit password given by the maker using the switch and KNOB select the required items [44]~[45] to activate/deactivate the authority. To cancel to enter the password input screen, select [46] Back.

! Note : Inappropriate setting of detailed parameters that is set at Engineer Level may cause serious abnormalities in welding performance. Only a professional or a person authorized by the manufacturer should operate it, and the manufacturer is not responsible for free service for any abnormality or malfunction of the system due to improper change of this setting by an unauthorized person.

[38] : User can select a device to set welding current, welding voltage, and wire feeding speed by welding power source. Devices that can be set are HMI, Hi-COMM, and wire feeder, and even if these devices are connected to the welding power source in duplicate, only the setting value selected in this setting can be recognized at the welding power source.

[39] : User can select a device that sets the system setting parameter with welding power source. Devices that can be set are HMI, Hi-COMM, and wire feeder, and even if these devices are connected to the welding power source in duplicate, only the setting value of the device selected can be recognized by the welding power source.

[40] : User can select a device to set the welding setting parameter by welding power source. Devices that can be set are HMI, Hi-COMM, and wire feeder, and even if these devices are connected to the welding power source in duplicate, only the setting value of the device selected can be recognized at the welding power source.

[41] : User can select the operation control mode of the cooling fan. When 'auto control' is selected, the cooling fan operates according to the set temperature in [42], and when 'always' is selected, the cooling fan always operates when the welding power source is 'ON'.

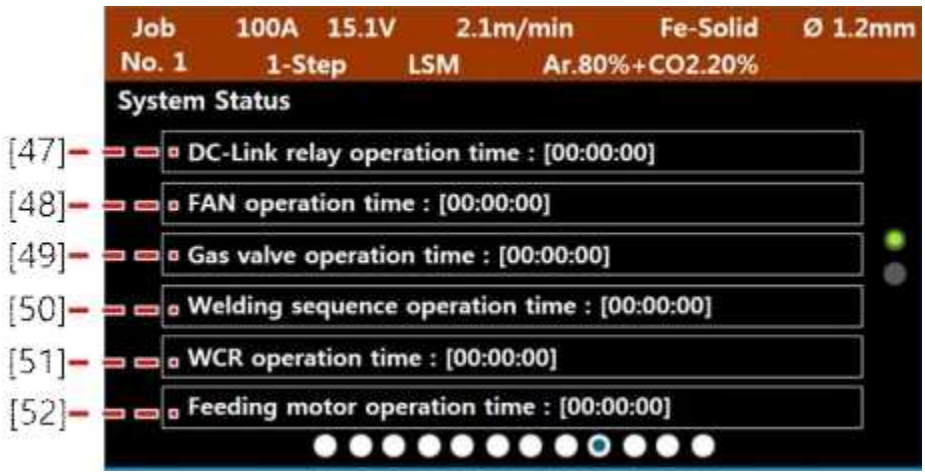
[42] : When [41] is 'auto control', you can set the temperature at which the fan operates. If the temperature of a specific part inside the welding power source is above this set temperature, the cooling fan operates, and when it falls below the set temperature, the cooling fan stops.

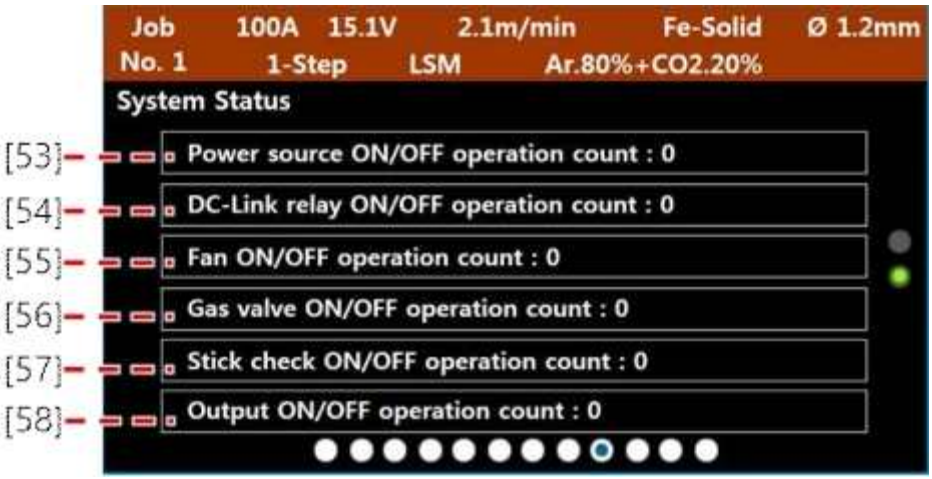
5. Operation and Function of Product

* The information on the setting values of the adjustable parameters within the welding system setting screen is shown in the table below.

Name	Initial	Min.	Max.	Adjustment Unit	Unit
A, V, m/min setting unit	**HMI**	HMI, Hi-COMM1, Hi-COMM2, Wire Feeder			
System parameters setting unit	**HMI**	HMI, Hi-COMM1, Hi-COMM2, Wire Feeder			
Welding parameter setting unit	**HMI**	HMI, Hi-COMM1, Hi-COMM2, Wire Feeder			
Fan control mode	**Auto Control**	Always, Auto Control			
Fan control temp. of auto mode	**40**	0	100	1	℃

9) System Status / Information Parameters Display Screen





[47] : Display accumulated operation time of DC LINK relay of power converter. [Hour : Min : Sec]

[48] : Display accumulated operation time of cooling fan. [Hour : Min : Sec]

[49] : Display accumulated operation time of solenoid valve. [Hour : Min : Sec]

[50] : Display accumulated operation time of welding sequence. [Hour : Min : Sec], welding sequence: the cycle that completes every programmed operation after recognizing start ON->OFF signal from welding power source.

[51] : Display accumulated operation time of WCR. [Hour : Min : Sec], WCR : Status in which the welding power source recognizes that welding (in which the welding current is detected) is in progress.

[52] : Display accumulated operation time of feeding motor. [Hour : Min : Sec]

[53] : Display ON/OFF accumulated number of welding power source. When welding power source turns OFF to ON, number is accumulated.

[54] : Display accumulated operation number of DC LINK relay of power converter. When it turns OFF-> On, number is accumulated.

[55] : Display accumulated operation number of cooling fan. When it turns OFF->ON, the number is accumulated.

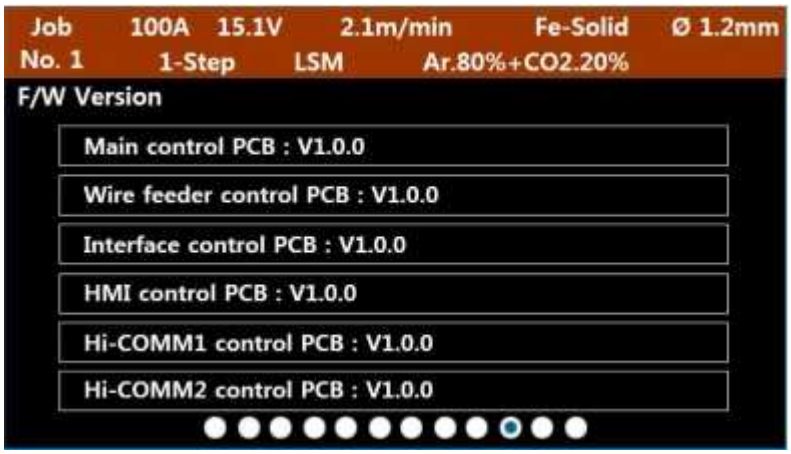
[56] : Display accumulated operation number of solenoid valve. When it turns OFF->ON, the number is accumulated.

[57] : Display accumulated operation number of stick check (Detection between wire and work piece). When stick check is on, the number is accumulated.

[58] : Display accumulated occurred number of welding output load. When it turns OFF->On, the number is accumulated.

*** Please refer to "6. Product Maintenance' of this manuel for the use of information.**

10) Firmware Information Display Screen



Available to check the firmware version information of the welding system driving PCB .

11) Error Log Display Screen

It displays error codes generated by operating time during welding machine operation. 100 error codes are allowed to record, and when the number of records is exceeded, error codes that occurred first are deleted. Error codes are recorded in the order of the most recent occurrence, error code, and operation time.

5. Operation and Function of Product

When there is an error during the operation of welding machine, a error indicator lamp(Red) of HMI lights on and a beep sound comes to indicate that an error has occurred. At this time, the user use the screen to move into the error log screen to check the error code, the error indicator lamp and the beep sound turn off.

If you ignore the error log screen or apply a welding torch signal while the cause of the error is not resolved, the error is repeated.

*** Please refer to '8. Troubleshooting and Inspection' of this manuel regarding error log use and action.**

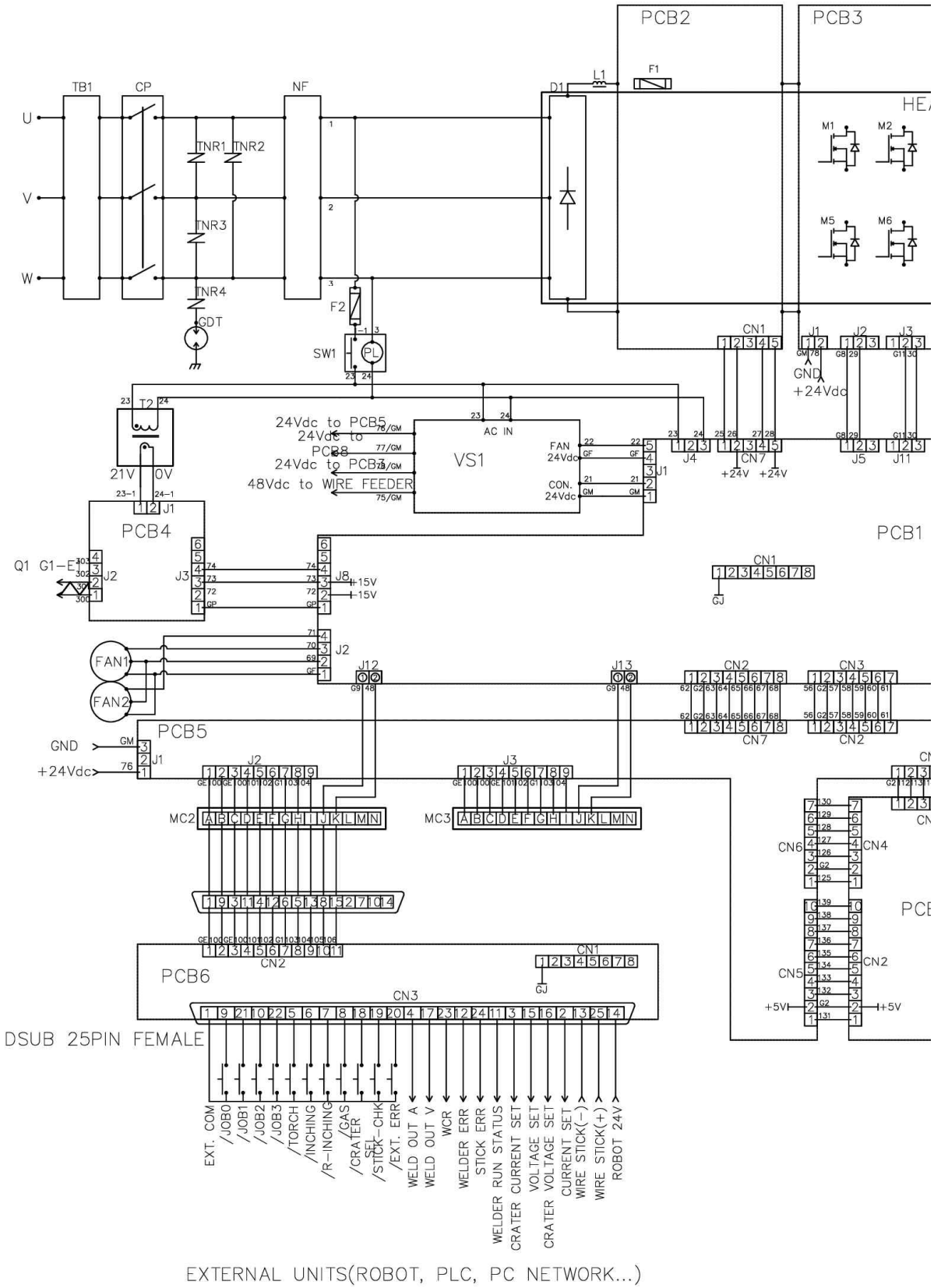
3. Setting of Robot Parameters (Setting Current, Voltage)

HYUNDAI(I/0)			
Robot Out	Current	Voltage (Manual mode)	Voltage (Synergic mode)
0.0 V	30 A	10.0 V	-50
1.7 V	83 A	14.3 V	-36
3.4 V	136 A	18.6 V	-21
5.1 V	189 A	22.9 V	-7
6.9 V	241 A	27.1 V	7
8.6 V	294 A	31.4 V	21
10.3 V	347 A	35.7 V	36
12.0 V	400 A	40.0 V	50

YASKAWA(I/O)			
Robot Out	Current	Voltage (Manual mode)	Voltage (Synergic mode)
0.0 V	30 A	10.0 V	50
2.0 V	83 A	14.3 V	64
4.0 V	136 A	18.6 V	79
6.0 V	189 A	22.9 V	93
8.0 V	241 A	27.1V	107
10.0 V	294 A	31.4 V	121
12.0 V	347 A	35.7 V	136
14.0 V	400 A	40.0 V	150

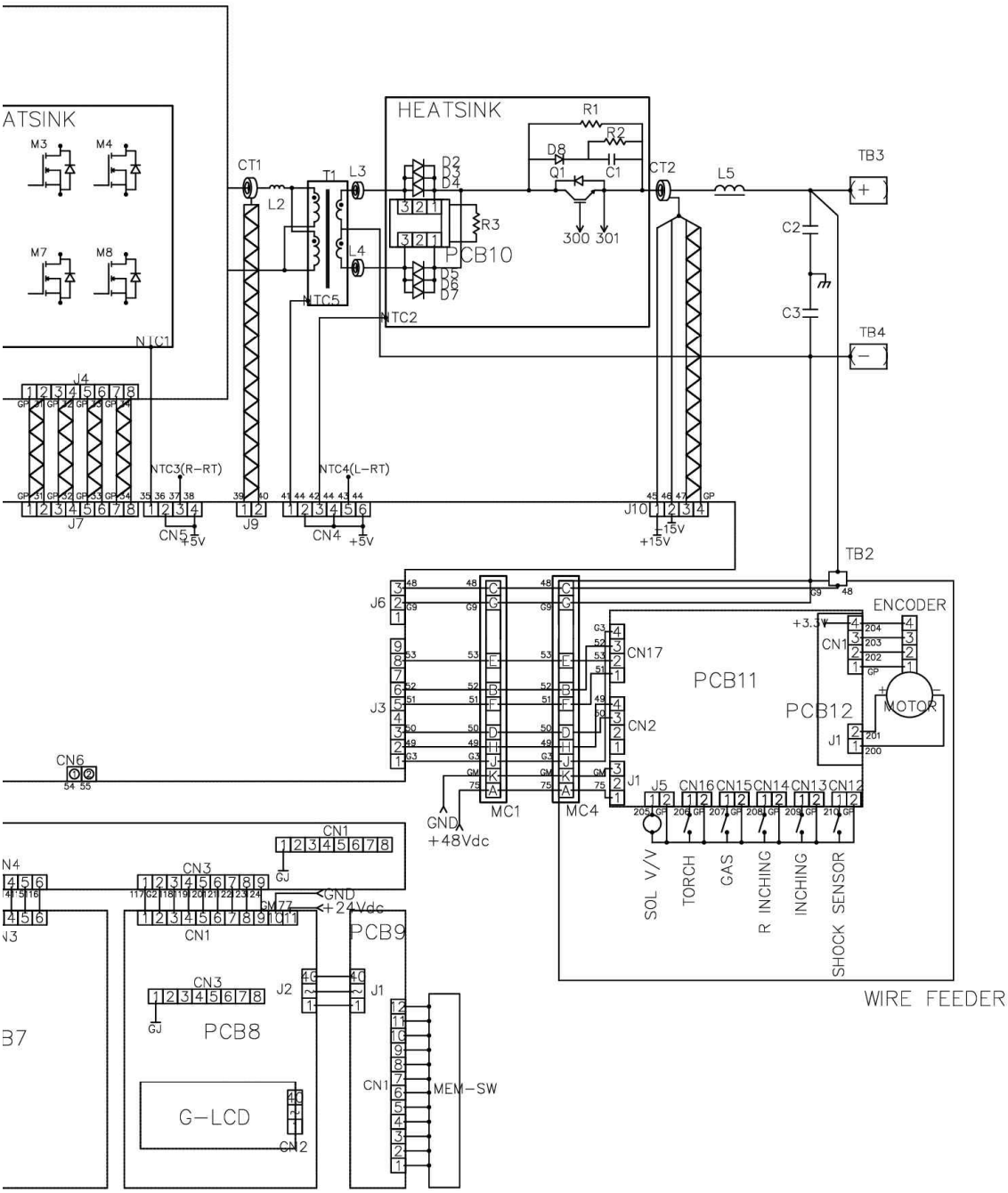
6. Product Maintenance

1. Schematic Diagram - Hi400i 220V I/O Interface

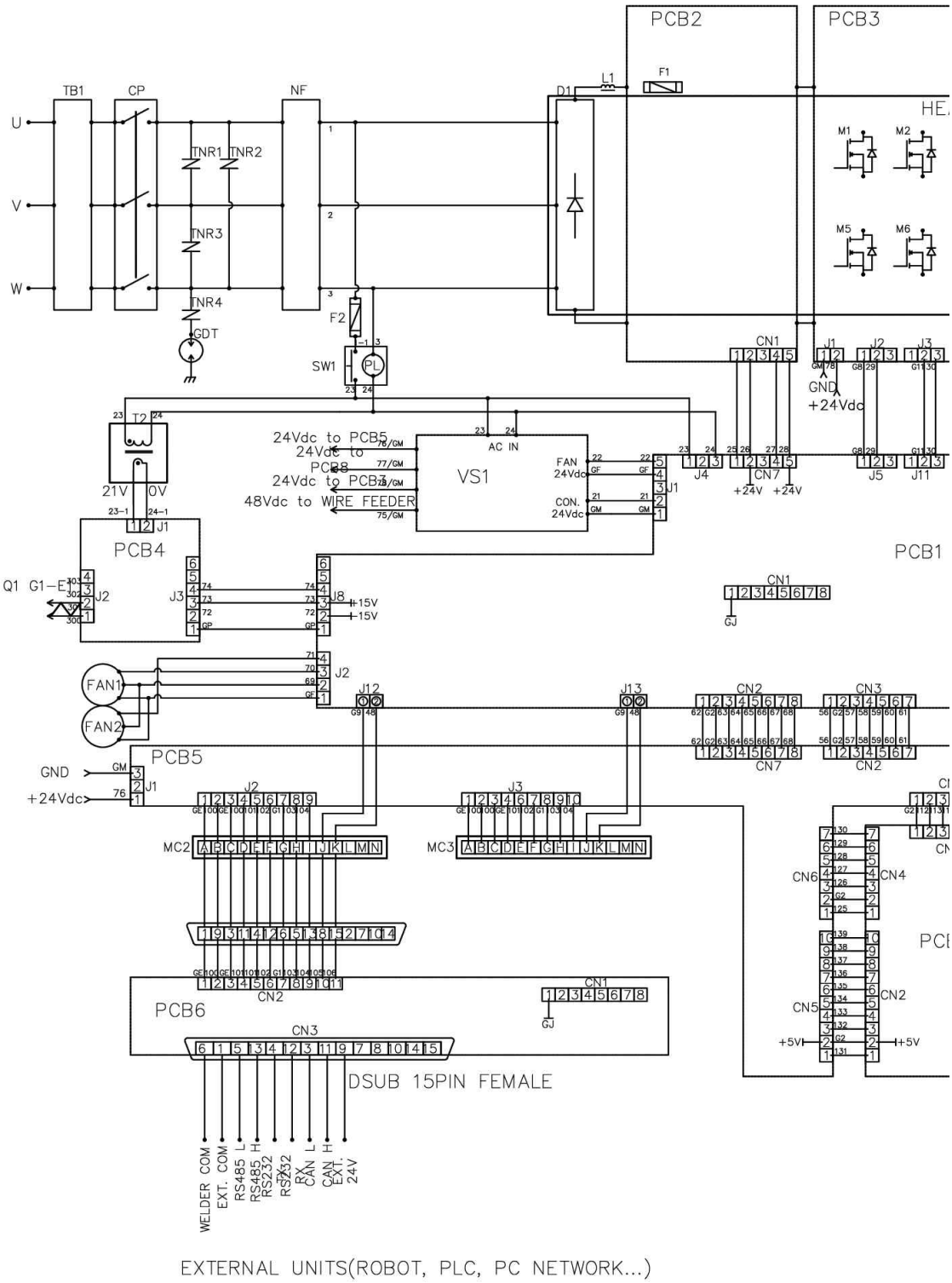


6. Product Maintenance

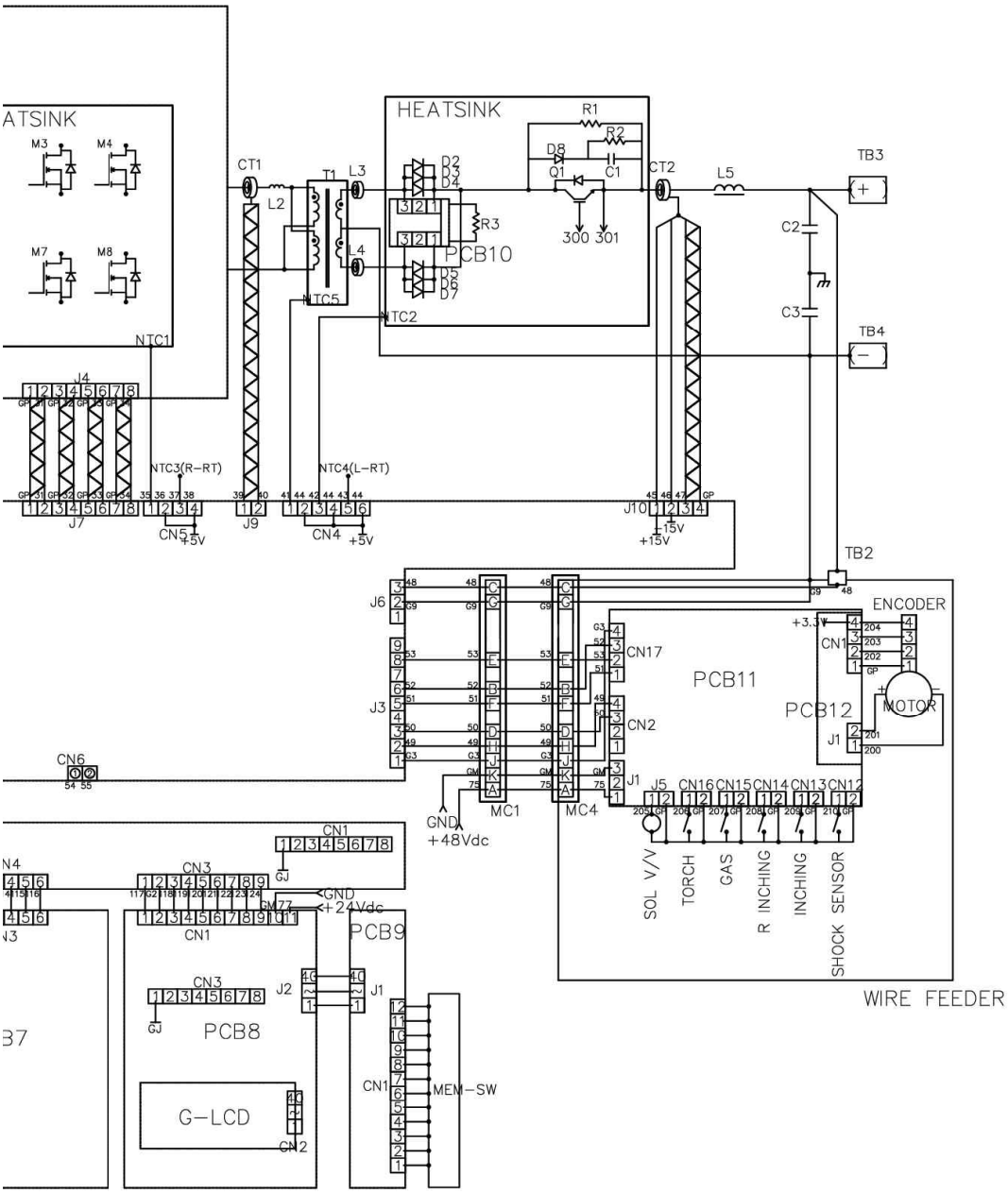
1. Schematic Diagram - Hi400i 220V I/O Interface



2. Schematic Diagram - Hi400i 220V Serial Interface

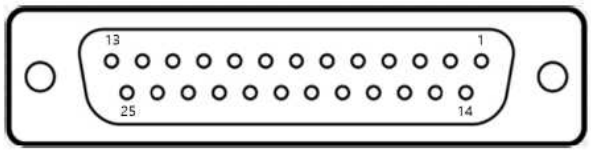


2. Schematic Diagram - Hi400i 220V Serial Interface



3. Hi- COMM IO Interface (PCB6) Detailed Schematic Diagram

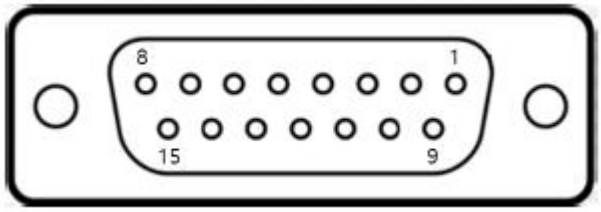
D- SUB 25PIN FEMALE (25pin)



No.	PIN name	Explanation
1	ROBOT_GND	+24VDC power GND connected to the robot controller
2	MAIN_WELD_SET_A	Analog input signal for main welding voltage command
3	CRATER_WELD_SET_A	Analog input signal for crater welding voltage command
4	WELD_OUTPUT_A	Welding feedback current analog output signal
5	/TORCH_SIG	Torch ON / OFF input signal
6	/INCHING_SIG	Inching ON / OFF input signal
7	/R-INCHING_SIG	R-Inching ON / OFF input signal
8	/GAS_CHECK_SIG	Gas check ON / OFF input signal
9	/JOB_BIN0_SIG	JOB number selection ON / OFF input signal0
10	/JOB_BIN2_SIG	JOB number selection ON / OFF input signal2
11	ROBOT_RELAY_GND	Relay GND for digital output
12	WELDER_ERROR_STATUS	Welding machine error status output signal
13	WIRE_STICK-	WIRE_STICK-
14	ROBOT_+24V	+24VDC connected to the robot controller
15	MAIN_WELD_SET_V	Analog input signal for main welding voltage command
16	CRATER_WELD_SET_V	Analog input signal for crater welding voltage command
17	WELD_OUTPUT_V	Welding feedback voltage analog output signal
18	/CRATER_SIG	Crater sequence ON / OFF input signal
19	/STICK_CHECK_SIG	Stick check sequence ON / OFF input signal
20	/ROBOT_ERROR_SIG	Robot error status input signal
21	/JOB_BIN1_SIG	JOB number selection ON / OFF input signal1
22	/JOB_BIN3_SIG	JOB number selection ON / OFF input signal3
23	WELD_WCR_STATUS	WCR status output signal
24	STICK_CHECK_STATUS	Stick status output signal
25	WIRE_STICK+	WIRE_STICK+

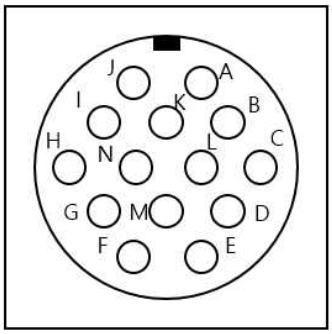
4. Hi- COMM Serial Interface(PCB6) Detailed Schematic Diagram

D- SUB 15PIN FEMALE (15pin)



PIN #	PIN name	Explanation
1	ROBOT_GND	+24VDC power GND connected to the robot controller
2	-	-
3	ROBOT_CAN_L	CAN communication signal connected to the robot controller
4	ROBOT_RS232_TX	RS-232 communication signal connected to the robot controller
5	ROBOT_RS485_L	RS-485 communication signal connected to the robot controller
6	ISO2_GND	Isolation GND for Hi-COMM communication
7	-	-
8	WIRE_STICK-	WIRE_STICK-
9	ROBOT_+24V	+24VDC connected to the robot controller
10	-	-
11	ROBOT_CAN_H	CAN communication signal connected to the robot controller
12	ROBOT_RS232_RX	RS-232 communication signal connected to the robot controller
13	ROBOT_RS485_H	RS-485 communication signal connected to the robot controller
14	-	-
15	WIRE_STICK+	WIRE_STICK+

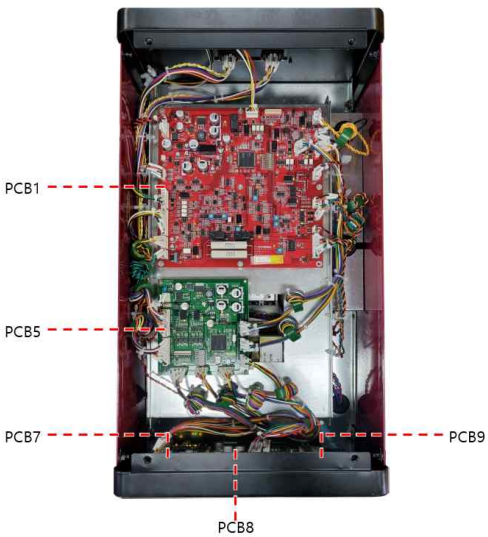
5. Hi400iD DeviceNet Interface(MC2, MC3) Detailed Schematic Diagram

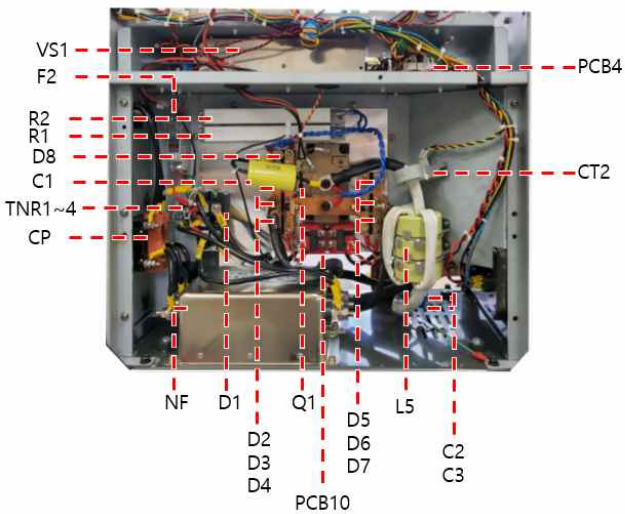


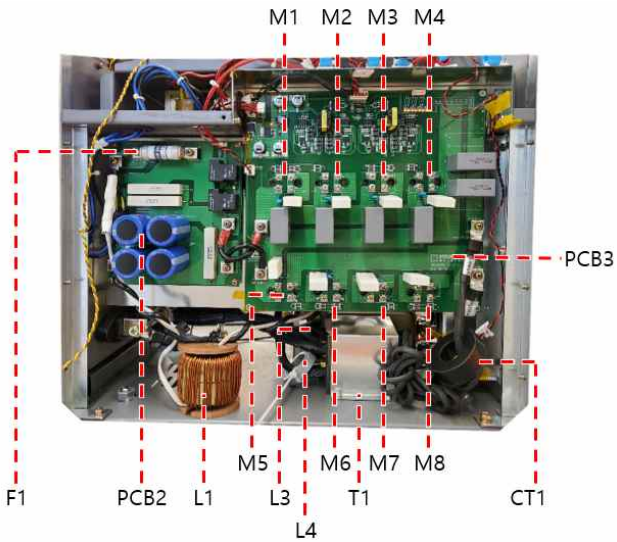
핀번	핀명	설명
A	V-	+24VDC power GND connected to the robot controller
B	V+	+24VDC connected to the robot controller
E	CAN L	CAN communication signal connected to the robot controller
F	CAN H	CAN communication signal connected to the robot controller
G	ISO_GND	Isolation GND for communication

6. Product Maintenance

6. Parts List - Hi400i Welding Power Source







6. Product Maintenance

Signal	Part name	Part number	Specification	QTY	Note
C1	Capacitor	45000423	10uF/630V	1	
C2,3	Capacitor	45000439	103/1kV	2	
CP	Protector	45000206	DCP73BH 73A 380V	1	
CT1	CT	45000424	CT800T	1	
CT2	CT	45000421	TM2A300-04DA15	1	
D1	Diode	40006421	MDS100A 1600V	1	
D2 ~ D8	Diode	40005610	EST100BN40S	7	
F1	Fuse	40005485	JR61-100A	1	
F2	Fuse	45000507	500VAC/DC 5A ø10x38mm	1	
FAN1,2	Fan	45000437	NMB 12038VA-24R-EL-00	2	
L1	Coil	45000485	CH610125x2	1	
L3,4	Ferrite core	-	51.5x13.5	2	
L5	Reactor	45000484	CH610125x3	1	
M1 ~ M8	MOSFET	45000530	IXFN150N65X2	8	220V
		40005839	IXFN56N90P	8	380V/440V
MC1	Connector	45000492	MS3102A 18-19P	1	
MC2,3	Connector	45000492	MS3102A 20-27P	2	
NF	Filter	45000520	ET3AA-2100 / 250V 100A	1	220V
		40004373	ET3AA-4040 / 450V 40A	1	380V/440V
PCB1	PCB	45000468	HICM500_01	1	
PCB2	PCB	45000469	HICM500_02	1	220V
		-	HICM500_06	1	380V/440V
PCB3	PCB	45000470	HICM500_03	1	220V
		-	HICM500_03	1	380V/440V
PCB4	PCB	45000528	HICM500_04	1	
PCB5	PCB	45000473	HAZD500_01	1	
PCB7	PCB	45000529	HICM500_05	1	
PCB8	PCB	45000471	HACD500_01	1	
PCB9	PCB	45000472	HACD500_02	1	
PCB10	PCB	40005832	HICE12-SNUBBER	1	
Q1	IGBT	45000006	1MBI 900V-120-50	1	
R1	Resistor	45000512	2ohm 150N	1	
R2	Resistor	45000513	500ohm 150N	1	
SW1	Switch	45000510	Push-Latch, ø25	1	220V
		-	Push-Latch, ø25	1	380V/440V
T1	Transformer	45000483	220V	1	220V
		-	380V/440V	1	380V/440V
T2	Transformer	45000491	Auxiliary TR 50VA	1	
TB1	Terminal	40003435	3Ph	2	
TB3,4	Terminal	40003443	ALPHA||	2	
TNR1 ~ TNR4	Surpressor	45000438	TNR(10V471K)	4	220V
		-	TNR(14V821K)	4	380V/440V
VS1	SMPS	45000531	TKS220A500V24-R2	1	220V
		45000068	TKS440A500V24-R2	1	380V/440V

6. Product Maintenance

7. Periodic Maintenance according to using time/number

When accumulated operation time of cooling fan exceeds 32,000 hours, recommend to replace FAN1 and FAN2.

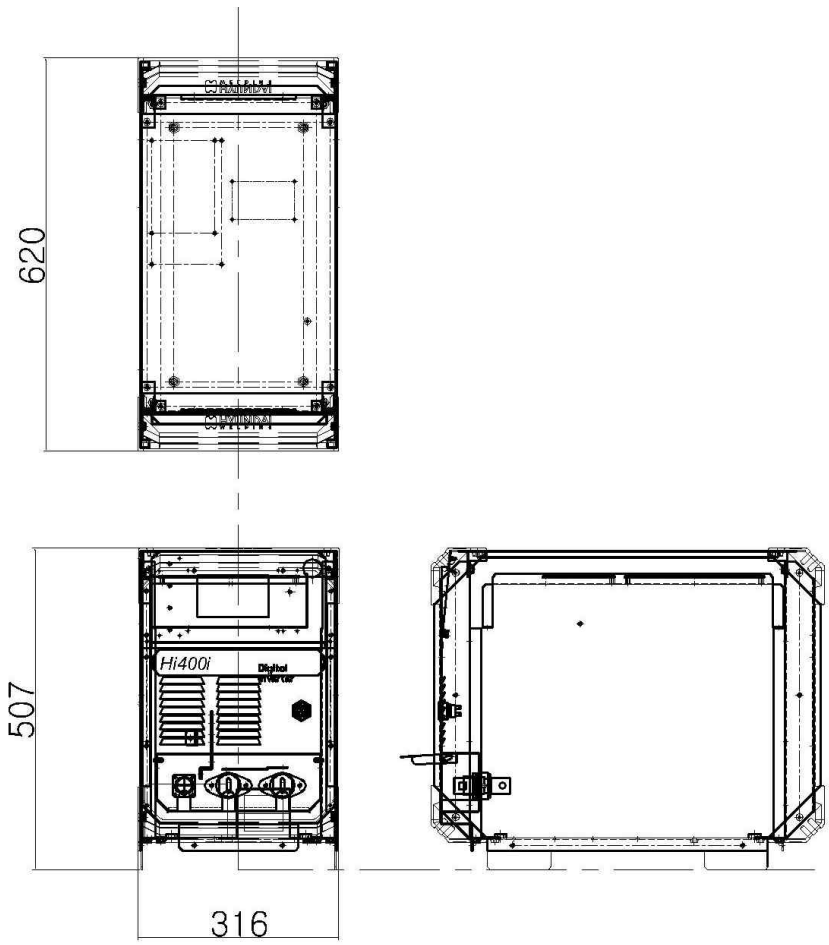
When ON/OFF accumulated number of cooling fan exceeds 680,000, recommend to replace RL1 of PCB1.

When ON/OFF accumulated number of DC LINK relay exceeds 100,000, recommend to replace PCB2.

When accumulated number of stick check exceeds 2,700,000, recommend to replace RL2 of PCB1.

When ON/OFF accumulated occurred number of welding output exceeds 2,700,000, recommend to replace RL3 of PCB1.

8. Outline Drawing- Hi400i

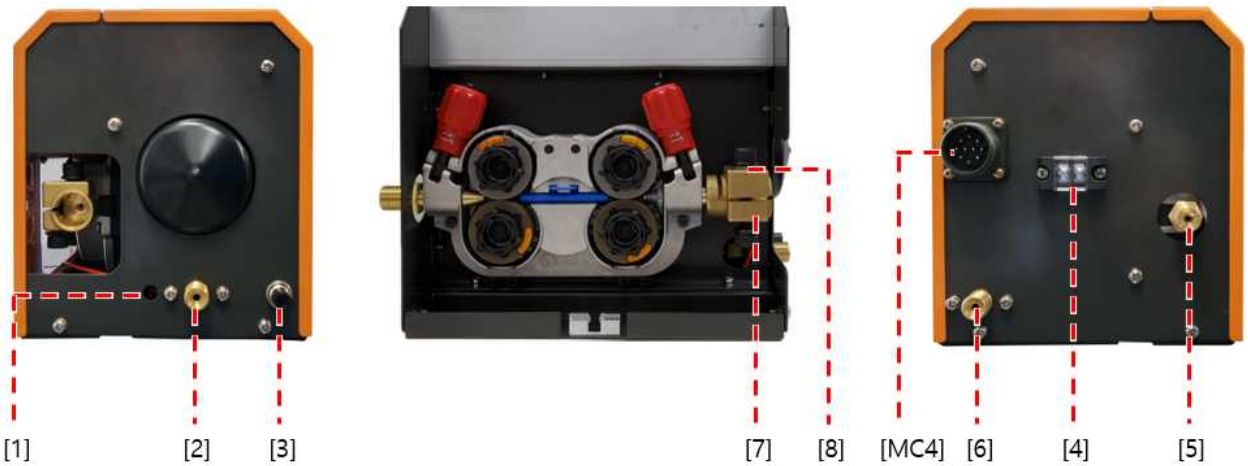


7. Wire Feeder

1. Specification

Model	RF- Hi400
Control method	Communication (CAN)
Motor spec. and control	DC24V / Encoder Control
Drive type	4Roll 4Geared
Feeding speed	0.8~20 m/min
Wire diameter	0.9, 1.0, 1.2mm
Torch connection	Asia Spec.
Dimension (W*D*H)	192 * 242 * 197(mm)
Weight	6.1(Kg)

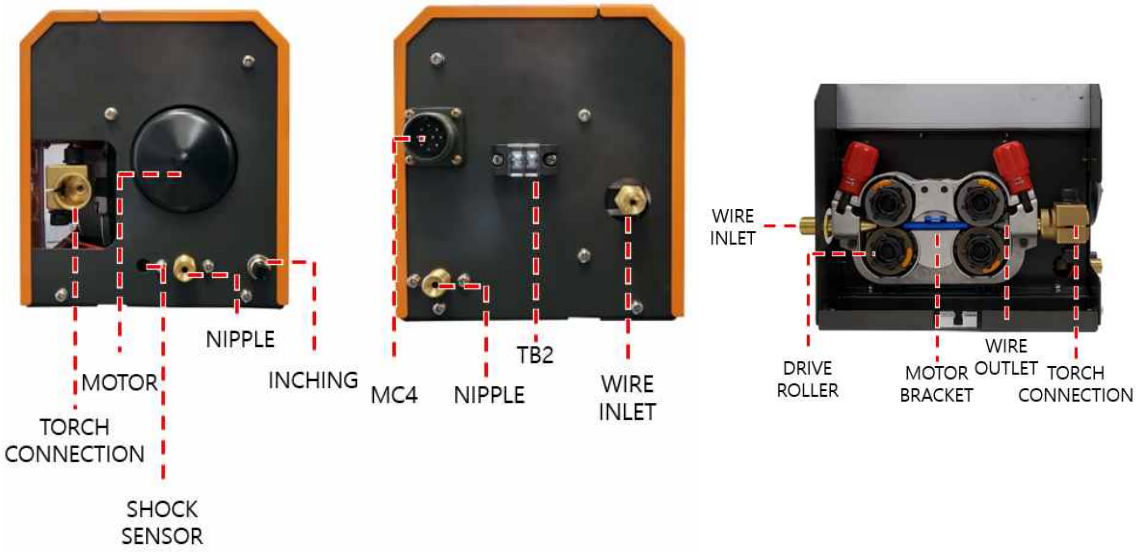
2. Installation

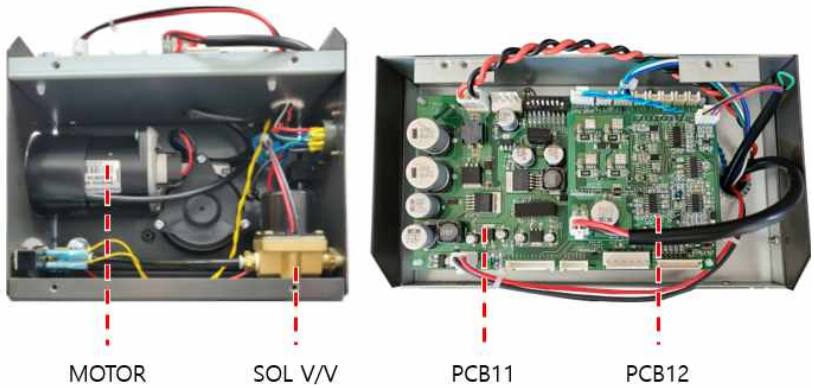


[1] Shock sensor cable connector : Connect the signal line of shock sensor.
[2] Shielding gas connector : Connect the shielding gas hose of welding torch.
[3] Inching switch : Feed the wire without generating the output.
[4] (-) Sensing cable terminal : Connect the (-) voltage sensing cable from the workpiece.
[5] Welding wire conduit cable connector : Connect the wire conduit cable from welding wire reel stand or wire spool of wire feeder.
[6] Shielding gas connector : Connect the shielding gas hose from gas tank.
[7] Welding torch connector : Connect the welding torch.
[8] (+) Output cable connector : Connect the (+) output cable from the welding power source.
[MC4] Control cable connector : Connect the control cable from the welding power source.

7. Wire Feeder

3. Parts List – RF- Hi400 Wire Feeder





Signal	Part Name	Part No.	Specification	Qty	Note
TORCH CONNECTION	Torch adaptor	45000441	M8 (Torch connector), M8 (Output cable)	1	
NIPPLE	Gas nipple	45000448	9/16 UNF	2	
SHOCK SENSOR	Circular connector	-	ø8 4p Push pull connector	1	
INCHING	Switch	45000447	SP103C	1	
MC4	MS connector	45000569	MS3102A-18-19-P (10p)	1	
TB2	Terminal	45000446	SL2T(2P)	1	
WIRE INLET	Push-in guide	45000440	-	1	
WIRE OUTLET	Push-out guide	45000442	-	1	
MOTOR BRACKET	Motor bracket	40005684	SWISSFEED ST4	1	
DRIVE ROLLER	Wire feeding roller	-	V-Groove 1.2mm for hard wire	4	
MOTOR	Feeding motor	40005684	ANKARSRUM-24V PM4228/181	1	
SOL V/V	Gas valve	45000448	DKC SD2002-02DN-02(24V)	1	
PCB11	Control PCB	45000474	HIFO500_01	1	
PCB12	Drive PCB	45000475	HIFO500_02	1	

7. Wire Feeder

4. Periodic Maintenance of parts according to Usage Time/Frequency

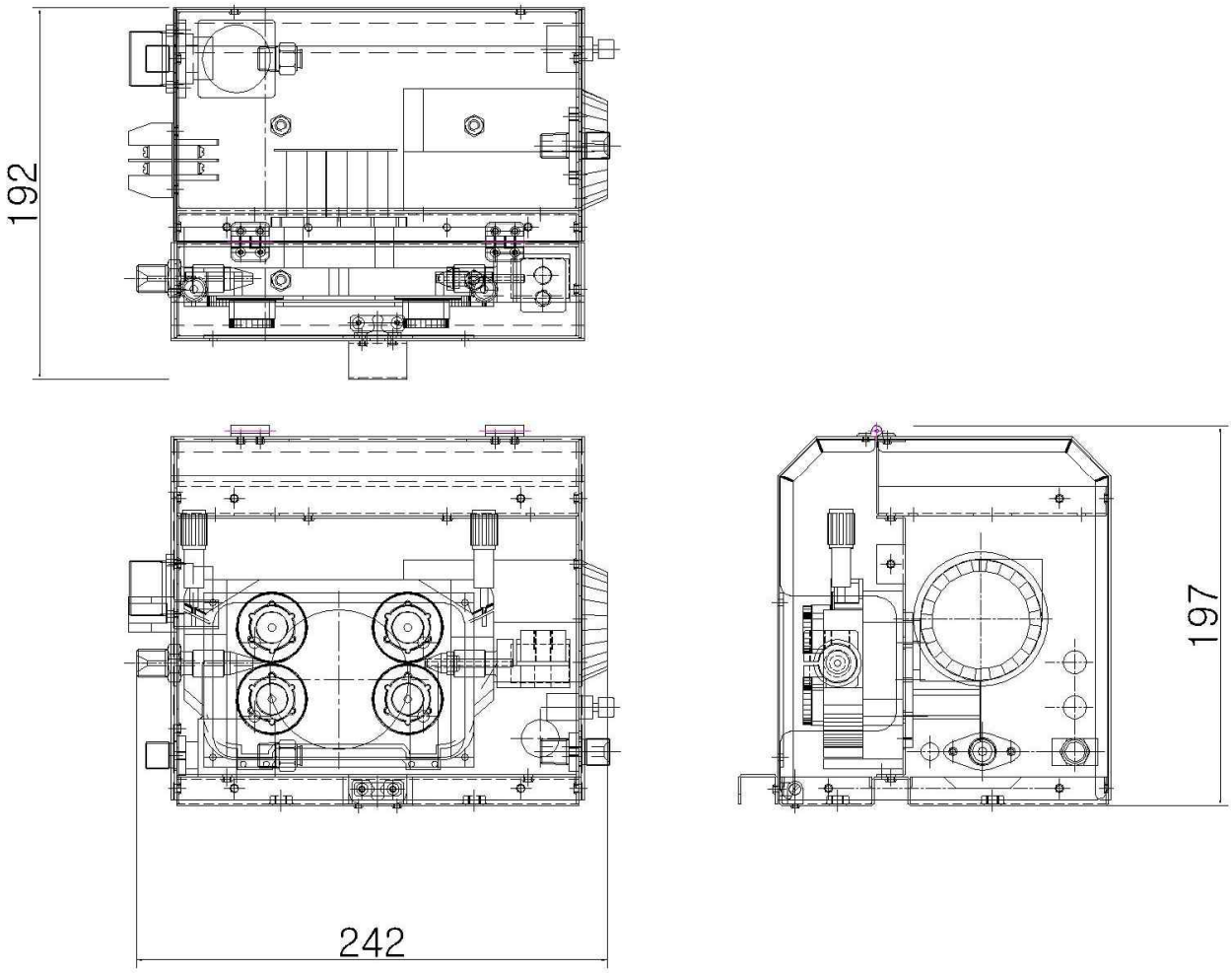
When accumulated operation time of the feeding motor exceeds 4,000 hours, check the condition of wire feeder roller, of the DRIVE ROLLER, and replace it if noise or friction occurs.

When accumulated operation time of the feeding motor exceeds 2,000 hours, check the wear on wire feeder roller by naked eyes and replace it if the wear condition is excessive.

When ON/OFF accumulated operation number of Solenoid Valve exceeds 5,400,000, recommend to replace SOL V/V.

7. Wire Feeder

5. Outline Drawing – RF- Hi400



8. Troubleshooting and Inspection

1. Regular Maintenance

	**HAZARD**	**Electric shock may result in death.**
  	• Before and after connecting the power source be sure to check the power source status during welding and voltage with a tester before working. 1) Be sure to work by a qualified electrician. 2) For installation and maintenance inspection, be sure to cut off the power source at the input of the distribution switch board circuit protector before working for at least 5 minutes. Since the voltage charged in the internal capacitor may remain, check that a the charging voltage is discharged before working. 3) Always check the power source and voltage before or after connecting the power source with a tester before working.	

8. Troubleshooting and Inspection

2. Check in accordance with the Error Code

Error Code	Cause	Countermeasure
E01	3-Phase under input voltage detection (-15% or less)	1. Check 3-Phase input voltage. - Within ±15% of rated input voltage 2. Replace PCB1. 3. Please contact our service team.
E02	3-Phase over input voltage detection (+15% or more)	
E03	DC-LINK under voltage detection (264Vdc or less) - J4(+)-J6(-) measured voltage of PCB2 - Rated input voltage AC 220V standard)	1. Check 3-Phase input voltage. - Within ±15% of rated input voltage 2. Check F1(Fuse) from PCB2. Replace if damaged. 3. Check the lighting status of LED2 from PCB2. 4. Check the lighting status of LED1 from PCB2. - LED lights on within about 1 minute after first power on. 5. Replace PCB1. 6. Replace PCB2. 7. Please contact our service team.
E04	DC-LINK over voltage detection (358Vdc or more) - J4(+)-J6(-) measured voltage of PCB2 - Rated input voltage AC 2200V standard)	1. Check 3 phase input voltage. - Within ±15% of rated input voltage 2. Replace PCB1. 3. Replace PCB2. 4. Please contact our service team.
E05	DC-LINK(primary side) over current error	1. Check F1(Fuse) from PCB2. Replace if damaged. 2. Replace PCB1. 3. Replace PCB2. 4. Please contact our service team.
E06	No load voltage output detection	1. Check the connection status of '+/- sensing line. 2. Check the connection status of control cable. (Welding power source ↔ wire feeder) 3. Damage to the power part is suspected. Please contact our service team.
E07	No output voltage is detected during welding	1. Check the connection status of '+/- sensing line. 2. Check the connection status of control cable. (Welding power source ↔ wire feeder) 3. Replace PCB1. 4. Please contact our service team.

8. Troubleshooting and Inspection

E08	No output current detected for more than 2 seconds during welding	1. Check if wire remains. 2. check the condition of work piece such as burn through. 3. Check an abnormality in the feeding of wire. - Check the operation of wire feeder. - Check whether there is an excessive Feeding Load, and take action when a Load occurs. 4. In case of repeated occurrence, please contact our service team.
E09	Welding output over current error	1. Select proper welding condition (CTWD, synergic database) 2. Check short circuit for output(+) / (-) terminal or between cables. 3. Check short circuit of tip and work piece during welding operation. 4. Check if speed of feeding motor controls correctly. (Check if the feeding speed set during inching operation matches the actual speed.) 5. Check the wire harness demage or connection of CT2 - PCB1 J10. 6. Replace CT2. 7. Replace PCB1. 8. Please contact our service team.
E10	Reserved	Reserved
E11	PCB1 power under voltage detection - 19.2Vdc or less - 21(+)-GM(-) measured voltage after separation of PCB1 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is less than the reference voltage of the measured voltage. 3. Replace PCB1. 4. Please contact our service team.
E12	PCB1 power over voltage detection - 28.8Vdc or more - 21(+)-GM(-) measured voltage after separation of PCB1 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is more than the reference voltage of the measured voltage. 3. Please contact our service team.
E13	PCB3 Power under voltage detection - 19.2Vdc or less - 21(+)-GM(-) measured voltage after separation of PCB3 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is less than the reference voltage of the measured voltage. 3. Replace PCB3. 4. Please contact our service team.

E14	PCB3 power over voltage detection - 28.8Vdc or more - 21(+)-GM(-) measured voltage after separation of PCB3 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is more than the reference voltage of the measured voltage. 3. Please contact our service team.
E15	Cooling fan power under voltage detection - 19.2Vdc or less - 22(+)-GM(-) measured voltage after separation of PCB1 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is less than the reference voltage of the measured voltage. 3. Replace cooling fan (FAN1, FAN2). 4. Replace PCB1. 5. Please contact our service team.
E16	Cooling fan power over voltage detection - 28.8Vdc or more - 22(+)-GM(-) measured voltage after separation of PCB1 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is more than the reference voltage of the measured voltage. 3. Please contact our service team.
E17	PCB5 power under voltage detection - 19.2Vdc or less - 76(+)-GM(-) measured voltage after separation of PCB5 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is less than the reference voltage of the measured voltage. 3. Replace PCB5. 4. Please contact our service team.
E18	PCB5 power over voltage detection - 28.8Vdc or more - 76(+)-GM(-) measured voltage after separation of PCB5 J1	1. Check 3-phase input voltage. - Within ±15% of rated input voltage 2. Replace VS1 if it is more than the reference voltage of the measured voltage. 3. Please contact our service team.
E19	Low voltage detection error of +15V auxiliary power on welding main control PCB.	1. Replace PCB1. 2. Please contact our service team.
E20	Overvoltage detection error of +15V auxiliary power on welding main control PCB.	2. Replace PCB1. 2. Please contact our service team.
E21	Low voltage detection error of +15V auxiliary power on welding main control PCB.	3. Replace PCB1. 2. Please contact our service team.
E22	Overvoltage detection error of +15V auxiliary power on welding main control PCB.	1. Replace PCB1. 2. Please contact our service team.
E23	When the welding power source is turned on while the torch signal is applied	1. Check whether the torch signal is applied. - Check whether the torch signal is applied of torch signal input external device (Hi-COMM Channel 1, 2, wire feeder) 2. Please contact our service team.

E24	No load output continuous (more than 10 seconds) error before welding current detection	1. Check that the welding start time is within 10 seconds after the welding torch signal. 2. Check if wire remains. 3. Check an abnormality in the feeding of wire. - Check the operation of wire feeder. - Check whether there is an excessive feeding load, and take action when a load occurs. 4. In case of repeated occurrence, please contact our service team.
E27	Welding power internal right high temperature error	1. Use at ambient temperature (40℃) or less. 2. Please keep the proper installation distance of the welding machine for ventilation. 3. Use it according to the rated duty cycle (60% 400A). 4. Check the operation of cooling fan (FAN1, FAN2). 5. Replace PCB1. 6. Please contact our service team.
E28	Welding power internal MOSFET high temperature error (over load)	
E29	Welding power internal left high temperature error	
E30	Welding power internal output diode high temperature error (over load)	
E31	Welding power internal main transformer high temperature error (over load)	
E32	Welding power internal upside high temperature error	
E33	Daisy chain1 recognition error - Poor connection status of wire harness connector of main PCB of welding power source	1. Check the connection of the wire harness connector connected to PCB in the welding power source. - PCB1 CN2/PCB5 CN2/CN4/CN5/PCB7 CN2/CN3 2. Please contact our service team.
E34	Daisy chain2 recognition error - Poor connection status of wire harness connector of main PCB of welding power source	1. Check the connection of the wire harness connector connected to PCB in the welding power source. - PCB1 CN3/PCB5 CN3/CN6/PCB8 CN1/PCB7 CN4 2. Please contact our service team.
E35	Cooling fan relay operation error	1. Replace PCB1.
E36	Cooling fan (FAN1) operation error - If the cooling fan does not run for more than 3 seconds	1. Check the presence of any foreign substances in the cooling fan. 2. Check the accumulated operation time of the cooling fan. (Refer to 6-6 of this manual) 3. Replace the non-operating cooling fan (FAN1 or FAN2) 4. Replace PCB1.
E37	Cooling fan (FAN2) operation error - If the cooling fan does not run for more than 3 seconds	

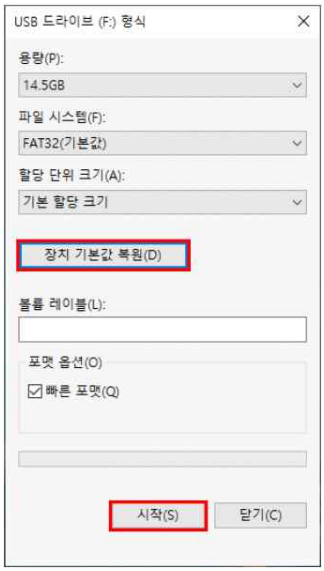
E38	Welding control PCB NVSRAM no response error	1. Initialize the welding machine (Refer to 5-2-2 of this manuel) 2. Replace PCB1. 3. Please contact our service team.
E39	Internal CAN communication error	1. Please contact our service team.
E40	Internal RS-232 communication error	1. Please contact our service team.
E41	Wire feeder under input voltage detection - 40.8Vdc or less - 75(+)-GM(-) measured voltage after separating PCB11 J1	1. Check the connection of control cable (welding power source ↔ wire feeder) 2. Check 3-phase input voltage. - Within ±15% of rated input voltage 3. Replace VS1 if it is more than the reference voltage of the measured voltage. 4. Replace PCB11. 5. Please contact our service team.
E42	Wire feeder over input voltage detection - 55.2Vdc or less - 75(+)-GM(-) measured voltage after separating PCB11 J1	1. Check the connection of control cable (welding power source ↔ wire feeder) 2. Check 3-phase input voltage. - Within ±15% of rated input voltage 3. Replace VS1 if it is less than the reference voltage of the measured voltage. 4. Please contact our service team.
E43	Wire feeder motor over current detection	1. Check an abnormality in the feeding of wire. - Check the operation of wire feeder. - Check whether there is an excessive feeding load (transformation of torch liner (bending), etc), and take action when a load occurs. 2. Check that the hole size of the contact tip matches the wire diameter being used. 3. Replace PCB12. 4. Replace PCB11. 5. Replace MOTOR. 6. Please contact our service team.
E44	Wire feeder motor encoder error	1. Check the connection of PCB12 CN1 connector, MOTOR encoder connector, and wiring. 2. Replace PCB11. 3. Replace PCB12. 4. Please contact our service team.

E45	Wire feeder shock sensor error	1. Check the shock sensor alarm status. 2. Check the operation sensor of shock sensor within robot motion range. - Torch length (short) or shock sensor alarm during robot movement 3. Check the wire connection of shock sensor. - Normal when cable is connected to contact B 4. Replace PCB11. 5. Please contact our service team.
E46	Wire feeder CAN communication error	1. Check the connection of control cable. (welding power source ↔ wire feeder) 2. Check the connection of the wire harness connector connected to the PCB in the wire feeder. - PCB11 CN12 3. Replace PCB11. 4. Please contact our service team.
E47	Main TR primary side over current Detection	1. Select the proper welding condition. (CTWD, synergic database). 2. Check the short circuit for output(+)/(-) terminal or between cables. - Make sure not to emerge short circuit. 3. Check the short circuit of tip and work piece during welding operation. 4. In case of repeated occurrence, please contact our service team.
E48	Hi-COMM channel 1 error	1. Check the connection of the Hi-COMM interface cable connected to channel 1. 2. Replace Hi-COMM.
E49	Hi-COMM channel 2 error	1. Check the connection of the Hi-COMM interface cable connected to channel 2. 2. Replace Hi-COMM.
E50	Reserved	Reserved
E51	Switching frequency under detection	1. Replace PCB1. 2. Please contact our service team.
E52	Switching frequency over detection	1. Replace PCB1. 2. Please contact our service team.

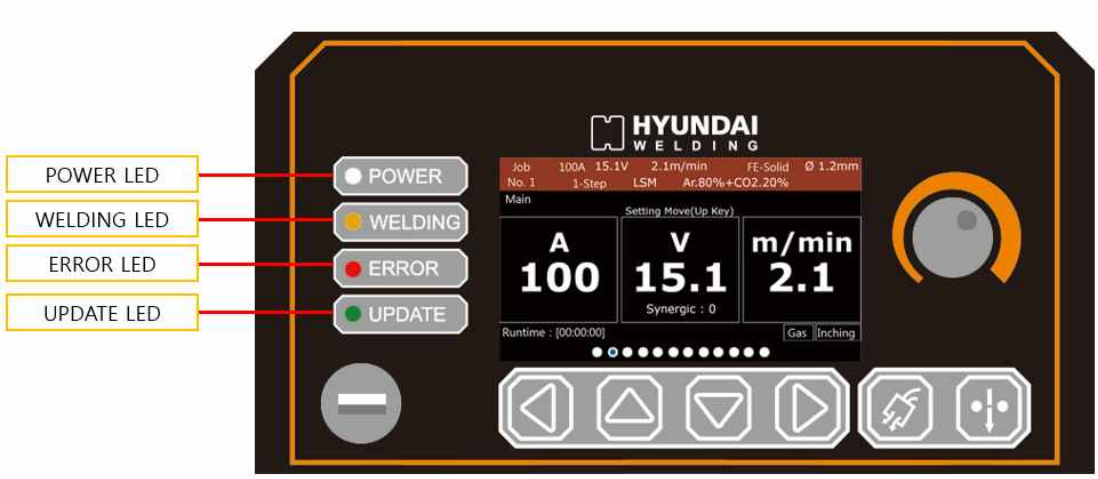
3. Product Firmware Update

To update the welding machine's firmware, the welding power-integrated firmware file (Hi400i_Ver_*.*.*.hwf) and USB flash memory are required.

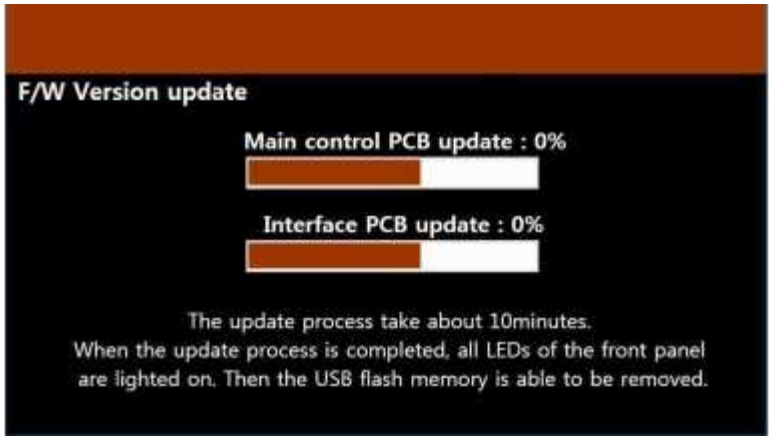
After connecting the USB flash memory to the USB port of the PC, format (FAT32) as follows.



If you insert the USB flash memory with the firmware stored in the USB port of the welding power source front panel, alarm UPDATE LED status in front after 10 seconds and the firmware update will proceed automatically. Firmware update proceeds in the order of welding control PCB, interface PCB, and HMI.



8. Troubleshooting and Inspection



When the welding power source internal PCB firmware update is completed, all status LED are lighted on. When the status of LED stays on for more than 3 seconds, the USB flash memory is automatically rebooted and the firmware update is completed.