Panasonic®

Operating Instructions

Inverter controlled GMAW DC Power Source

Model No. YD-400VP1YHD

- Before operating this product, please read the instructions carefully and save this manual for future use. Please also read the operating instructions of peripheral equipment.
- First, please read the "Safety Precautions".

English version is the original instructions.

WMD078TE0PAA07

2011

♦Introduction

This document is the operating instructions of welding power source for CO_2/MAG/MIG welding, YD-400VP1YHD.
In addition to the welding power source, it is necessary to prepare peripheral equipment to perform welding operation. (See section "4. Configuration" on page 14.)

♦Applicable welding processes

- CO2 welding
- MAG welding
- MIG welding

* Arc spot welding is applicable to all the above four processes.

♦Features

- **Visibility and operability are improved,** thanks to introducing large digital and LCD.
- **Simple and easy welding condition settings,** thanks to "Weld NAVI." and "THICKNESS settings"
- **Toughness, dust-proofness and maintainability are improved**.
- **Semi-automatic welding and Automatic welding are auto-switchable.**

  * For details, see section "6.1.2 Connecting base metal (-) voltage detection wire" on page 38.

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- ♦ This operating instructions manual is based on information current as of November, 2020.
- ♦ The information in this operating instructions manual is subject to change without notice.

♦Table of Contents

1. Safety Precautions

In addition to this section, read the “Safety Manual” supplied with this product.
Also read “Operating Instructions” supplied with peripheral equipment.

♦Signal Words and Safety Symbols

Signal Words	
⚠ WARNING	
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.	
⚠ CAUTION	
Indicates a potentially hazardous situation which, if not avoided, could result in minor injury or property damage.	
Safety Symbols (Examples)	
	Indicates a prohibited action.
	Indicates a mandatory action.
	Indicates a hazard alert.

Observe the following for safe operation of welding power source.

⚠ WARNING

Welding power source

	Observe the following cautions to prevent accidents that can cause serious injuries.

(1) Follow all instructions, heed safety warnings, cautions and notes herein. Failure to do so can result in serious injury or even death.

(2) Never use the welding power source for purposes other than welding, such as for pipe thawing.

(3) Work related to the driving source on the input side, selection of installation site, handling, storage and piping of high pressure gas, storage of welded or cut products and also the disposal of waste should be performed according to the applicable laws and regulations, and standard of your company.

(4) Prevent any unauthorized personnel from entering in and around the welding work area.

(5) Pacemaker wearers should consult their doctor before going near the welding work site. Magnetic fields can affect pacemakers.

(6) Only trained and/or skilled personnel who properly understand this welding power source should install, maintain and repair it.

(7) Operators of this product must be fully conversant with operating instructions and have knowledge and skill of safe handling.

Electric Shock Prevention

	Observe the following instructions to prevent fatal electric shock or burn.

(1) Do not touch any live parts.

(2) Only trained and/or skilled personnel should perform grounding of the case of the welding power source, the base metal and jigs electrically connected to the base metal.

(3) Before installation or maintenance work of the welding power unit, turn off all input power including power at the power distribution box, and leave it for five minutes to discharge the capacitors. Check to make sure that no charged voltage present at capacitors before touching any parts.

(4) Do not use undersized, worn, damaged or bare wired cables.

(5) Firmly connect cables and insulate the connected parts.

(6) Do not use product with a case and panel either removed or not in place.

(7) Do not handle the welding power source with torn or wet gloves.

(8) Wear a safety harness when working above the floor level.

(9) Perform periodic checks without fail. Repair or replace any damaged parts as required prior to use.

(10) Turn off the input power of all equipment when not in use.

(11) The welding power source must be grounded and the work must be grounded in accordance with ANSI Z49.1 (For North America).

Ventilation and Protective Equipment

Oxygen deficit, fume and gas generated during welding can be hazardous.

(1) Provide sufficient ventilation or wear breathing equipment specified by applicable laws (occupational health and safety and regulations, ordinance on the prevention of oxygen deficiency and similar rules).

(2) Use a local exhauster specified by the applicable law (occupational safety and health regulation, rules on preventing injury by inhaled dust or etc.) or wear a protective breathing gear. If a protective breathing gear is used, it is recommended to use one with an electric fan with high protection performance.

(3) When welding in the bottom, such as in a tank, boiler and the hold of a ship, use a local exhauster or wear breathing equipment specified by the applicable laws and regulations.

(4) When welding in a confined area, make sure to provide sufficient ventilation or wear breathing equipment and have a trained supervisor observe the workers.

(5) Do not weld at a site where degreasing, cleaning or spraying is performed. Welding near the area where any of these types of work is performed can generate toxic gases.

(6) When welding a coated steel plate, provide sufficient ventilation or wear protective breathing gear. (Welding of coated steel plates generates toxic fume and gas.)

(7) Never ventilate with oxygen. Refer to ANSI Z49.1 (For North America).

Fire, Explosion and Blowout Prevention

Observe the following cautions to prevent fires explosion or blowout.

(1) Remove any flammable materials in and around the work site to prevent exposure of such flammable materials to spattering. If they cannot be relocated, cover them with a fireproof cover.

(2) Do not conduct welding near flammable gases. Do not place the welding power source near flammable gases, otherwise, such gases may catch fire from a spark of electricity inside the welding power source as it is electric equipment.

(3) Do not bring hot base metal, such as a piece immediately after welding or cutting, near flammable materials immediately after welding.

(4) When welding a ceiling, floor or wall, remove all flammable materials, including ones located in hidden places.

(5) Wire the cables correctly and connect them tightly. Insulate the connected parts surely so that no exposed conductive part touches the cases or housings. (Poor cable connection or incomplete current path on the base metal side, such as steel, if any, can cause fire due to the heat generated by energization.)

(6) Connect the base metal cable as close to the welding position as possible. (If not, unexpected current path may be created, which can cause fire due to the heat generated by energization.)

(7) Do not weld a sealed tank or a pipe that contains gas.

(8) Keep a fire extinguisher near the welding site in case of an emergency.

No Disassembling/Modification

Unauthorized disassembling or modification can cause fire, electric shock or breakdown.

(1) Contact a Panasonic sales representatives for repair work.

(2) Follow the instructions in the operating instructions for any required inspection of the inside of the product.

⚠ CAUTION

Installing Shielding (Curtain etc.)

Arc flash, flying spatter slugs and noise generated during welding can damage your eyes, skin and hearing.

(1) When welding or monitoring welding operation, wear safety glasses with sufficient light blocking structure or use a protective mask designed for welding.

(2) When welding or monitoring welding operation, wear protective clothing designed for welding, such as leather gloves, leg covers and a leather apron, and also wear long-sleeve shirts.

(3) Install a protective curtain around the welding operation site to prevent exposure of eyes of people in the surrounding area to the arc flash.

(4) Be sure to wear noise-proof protective equipment, such as ear muffs and ear plugs, if the noise level is high.

Gas Cylinder and Gas Flow Regulator

Overturn of gas cylinder or blowout of gas flow regulator can cause injury.

(1) The gas cylinder must be handled properly according to applicable laws and in-house standards.

(2) Use the gas flow regulator that is supplied or recommended by our company.

(3) Read and observe the precautions described in the operating instructions of the gas regulator prior to use.

(4) Secure the gas cylinder to a dedicated gas cylinder stand.

(5) Do not expose the gas cylinder to high temperature.

(6) When opening the valve of the gas cylinder, do not bring your face close to the discharge outlet.

(7) When the gas cylinder is not in use, be sure to put the protective cap back on.

(8) Do not hang the welding torch on the gas cylinder. Do not allow the electrode to touch to the gas cylinder.

(9) Only the specified contractor should perform disassembly or repair work on the gas flow regulator. Such work requires some expertise.

Rotating Parts

Rotating parts can cause injury.

(1) Never bring your hands, finger, hair or clothes near the rotating cooling fan and feed rollers. They could get caught in moving part, causing injury.

(2) Do not use the product when the case and panel are removed or not in place.

(3) Only trained and/or skilled personnel who properly understand welding machines should perform maintenance and repair work. During maintenance or repair work, provide a fence or similar form of protection around the welding machine to prevent unauthorized individuals from accidentally coming close to the area.

Welding Wire

Welding wire, especially wire tip part, extending out from the end of welding torch can cause injury by sticking into the eye, face or body.

(1) Do not perform inching operation or press the torch switch with your eyes, face or body close to the end of the welding torch. Wire extends out from the end of the welding torch and may stick into the eye, face or body.

(2) When using a torch cable with the resin liner, straighten the torch cable and reduce the preset feed amount (current) to half or less before applying the wire inching.

(3) If the high speed wire inching is executed with the torch cable extremely-bent, the welding wire may pass through the resin liner and the cable. Replace any damaged liner/cable with a new one without fail. Never use a damaged liner/cable, or it can cause gas leak or insulation deterioration.

Insulation Deterioration Prevention

Insulation deterioration of welding power source can cause fire.

(1) Keep enough distance from welding power source when performing welding or grinding operation to prevent spatter or iron particles from getting into the welding power source.

(2) Perform periodic inspection and maintenance work to prevent insulation deterioration due to accumulated dust or dirt.

(3) When spatter or iron particles get into the welding power unit, turn it and power distribution box off, and then perform the air blow process.

(4) Replace any damaged liner or cables as they can cause gas leakage and insulation deterio-ration.

(5) To prevent accumulation of dust and dirt inside the welding power source, do not use product with a case and panel either removed or not in place.

2. Specifications

2.1 Welding machine

Model	YD-400VP1YHD
Rated input voltage (Allowable fluctuation range)	400 V (360 V to 440 V)
Number of phases	3-phase
Rated frequency	50 Hz/60 Hz (Common)
Rated input	17.8 kVA
	16.0 kW
Efficiency	82 %
Idle state power consumption	44 W
Rated no-load voltage	78 V DC
Rated output current	400 A
Rated output voltage	34 V
Rated duty cycle	60 %
Output current adjustable range	30 A DC to 400 A DC
Output voltage adjustable range	12 V DC to 38 V DC
Power control process	IGBT inverter type
Memory	100-channel Reproducible storage
Sequence	Main welding, Main welding-Crater, Initial welding-Main welding-Crater, Arc spot
Waveform control process	Digital setting [-99 (low) to 0 (Standard) to 99 (high)]
Applicable welding process	CO_2, MAG, MIG, Pulsed MAG, Pulsed MIG
Applicable shield gas	CO_2 welding: CO_2 100 % MAG welding: Mixed gas of 80 % Ar and 20 % CO_2 Stainless steel MIG welding: Mixed MIG gas of 98 % Ar and 2 % O_2 Aluminum MIG welding: Ar 100 % (MIG gas)
Applicable wire size (diameter)	0.8 mm/0.9 mm/1.0 mm/1.2 mm/1.4 mm/1.6 mm
Applicable wire type(*)	Mild steel (MS-SOLID), Flux cored mild steel (MS-FCW), Stainless steel (SUS-SOLID), Flux cored stainless steel (SUS-FCW) [FCW: Flux cored wire], Hard aluminum (AL-HARD), Soft aluminum (AL-SOFT)
Pre-flow time	0.0 s to 10.0 s (Increment of 0.1 s)
Post-flow time	0.0 s to 10.0 s (Increment of 0.1 s)
Arc spot time	0.3 s to 10.0 s (Increment of 0.1 s)
Input terminal	Terminal block (for L1(U), L2(V), L3(W) and PE, M5 bolting)
Output terminal	Coupling device
Insulation class	Class-H
IP code	IP21S (Indoor only)
EMC classification	Class A
Dimensions (WidthxDepthxHeight)	380 mm x 540 mm× 800 mm (Excluding the input terminal cover at the rear panel.)
Mass (Weight)	72 kg
List of equivalent	—

(*) For robot welding, only Mild steel (MS-SOLID), Flux cored mild steel (MS-FCW), Stainless steel (SUS-SOLID), Flux cored stainless steel (SUS-FCW) are applicable.

Note

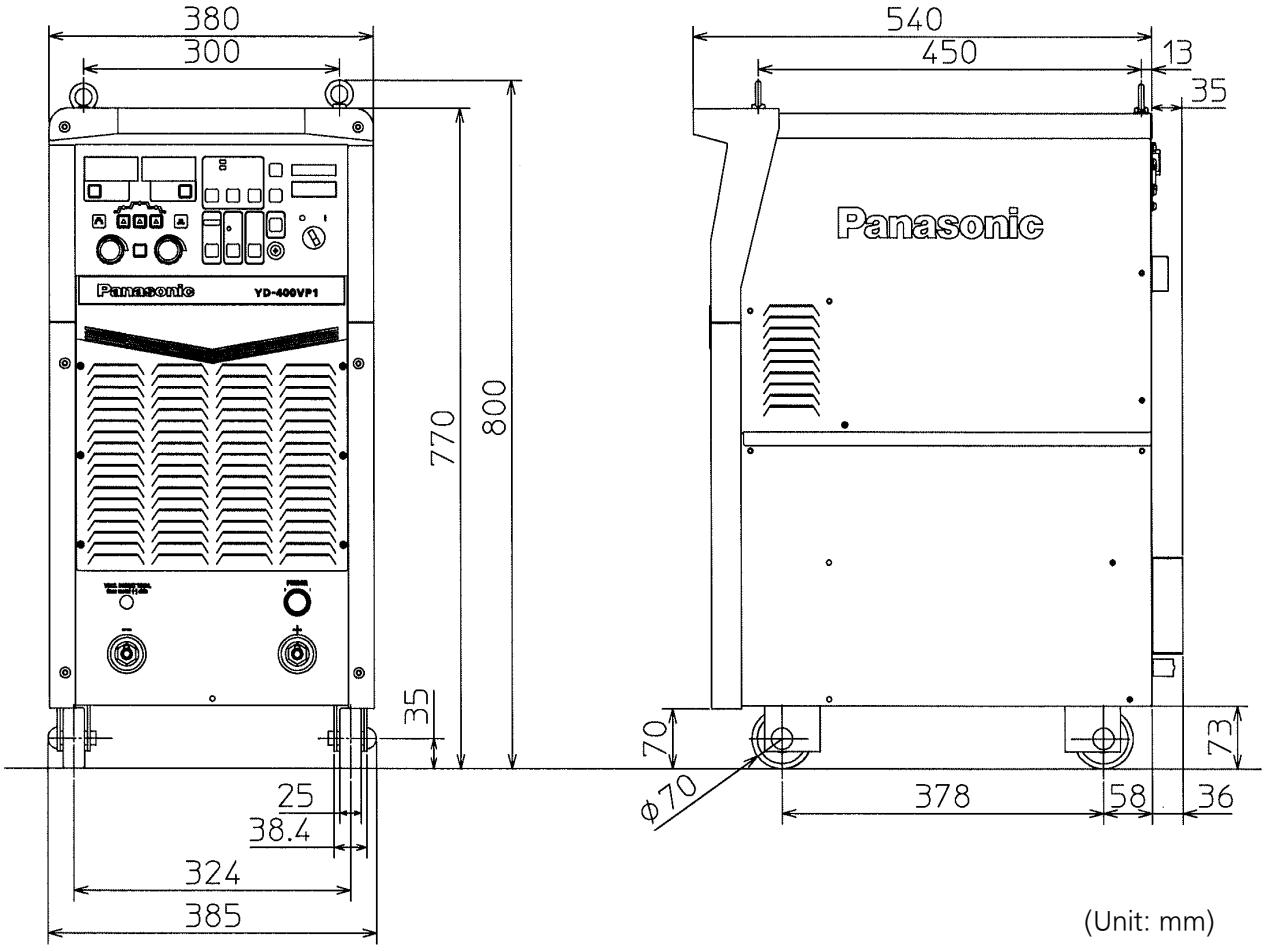
About EMC classification (Class A)

- This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated radio-frequency disturbances.
- Provided that the public low voltage system impedance at the point of common coupling is lower than 130 m-ohm and the short circuit power is higher than 6 MVA, this equipment is compliant with IEC 61000-3-11 and IEC 61000-3-12 and can be connected to public low voltage systems. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the system impedance complies with the impedance restrictions.

2.2 Standard accessories

Part name	Part number	Qty	Remarks
Glass tube fuse	BET6.3A	1	Safety part, 6.3A, For motor on front panel
	BET3.15A	1	Safety part, 3.15A, For volt detect on rear panel.

2.3 Dimensional drawings



(Unit: mm)

2.4 Applicable arc characteristics

Wire material(*1)	Wire type	Shield gas	Wire size (mm)	Wire extension(*2) (mm)
Mild steel	Solid wire	CO_2	0.8	10
			0.9	12
			1.0	15
			1.2	15, 20
			1.4	20
		MAG	0.8	10
			0.9	12
			1.0	15
			1.2	15, 20
			1.4	20
		Pulsed MAG	0.9	12
			1.0	15
			1.2	15
			1.4	20
	FCW (Flux cored wire)	CO_2	1.2	20
			1.4	20
		MAG	1.2	20
Stainless steel	Solid wire	MIG	0.8	10
			0.9	12
			1.0	15
			1.2	15
		Pulsed MIG	0.9	12
			1.0	15
			1.2	15
	FCW (Flux cored wire)	CO_2	0.9	12
			1.2	20
		MAG	1.2	20
Hard aluminum	Solid wire	MIG	1.0	15
			1.2	15
			1.6	15
		Pulsed MIG	1.0	15
			1.2	15
			1.6	15
Soft aluminum	Solid wire	MIG	1.2	15
			1.6	15
		Pulsed MIG	1.2	15
			1.6	15

(*1)For robot welding, only mild steel and stainless steel are applicable.

(*2)To use it with automatic welding machine, the wire extension can be set as shown in the above table. See “8.6 Group3: SYSTEM settings” on page 104.

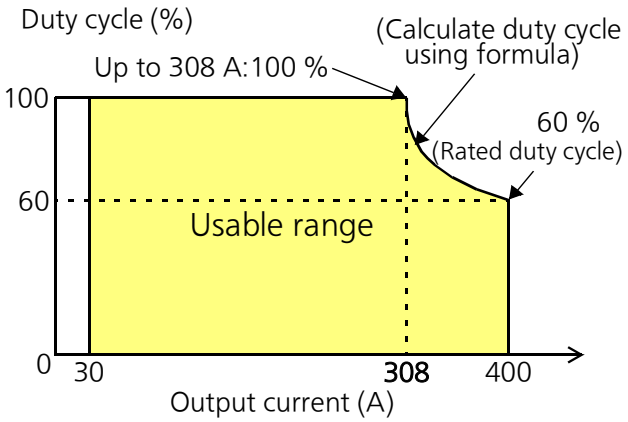
2.5 Rated duty cycle

⚠ CAUTION

Accumulated dust on the cooling fan(s), heat sinks, main semiconductor(s), or windings can reduce allowable duty cycle or allowable weld current, which can cause deterioration or burnout of the welding machine. Clean these sections periodically.

The rated duty cycle of this welding machine is 60 %. This means that the machine can weld for a total of 6 minutes out of any 10 minutes at the rated current, and then must cool down during the remaining 4 minutes to prevent overheating.

[Allowable duty cycle vs. Output current (10-minute cycle, ambient temp. 40 °C)]



As shown on the above figure, the allowable duty cycle varies with the output current. A duty cycle on the curved line can be calculated using the following formula.

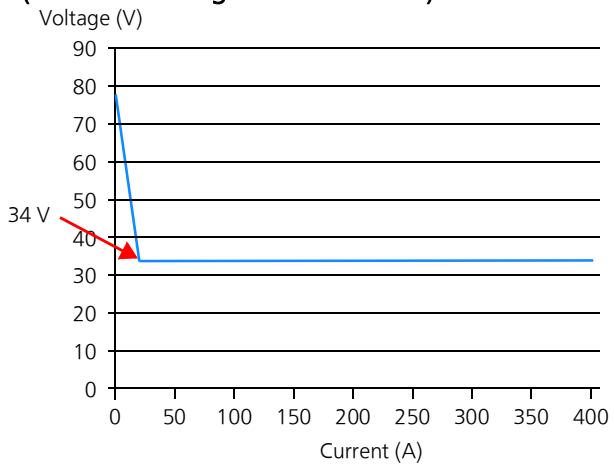
$$\text{Allowable Duty Cycle (\%)} = \left(\frac{\text{Rated Output Current}}{\text{Actual Output Current}}\right)^2 \times \text{Rated Duty Cycle (\%)}$$

Note

- Observe the lowest allowable duty cycle of the welding system components (typically either the welding machine or the torch).
- Exceeding the allowable duty cycle will cause the unit to stop automatically (with error displayed) or burn.
- If the ambient temperature is higher than 40 °C, limit the duty cycle to a level lower than the result of the formula.
- Output current values for pulsed welding are the average of the base and peak current values.

2.6 Static characteristics and thermal protection

Static characteristics (Constant-voltage characteristics)



Thermal protection

Welding power source is equipped with a thermal protection device near the heat sink of IGBT and reactor to monitor the temperature. The thermal protection functions when the welding power source goes into an abnormal temperature rise condition and stops the output.

* Do not use the welding power source under the following conditions.

- At the output voltage above the rated value.
- With the suction opening blocked.
- Ambient temperature is above 40 °C.
- If the cooling fan does not rotate.

2.7 Functions of cooling fan

- The cooling fan starts its rotation in 13 seconds after turning on the power switch.
- The cooling fan rotates at low speed in the standby state.
- The cooling fan stops its rotation to conserve energy if the standby state continues for 7 minutes or longer.
- The cooling fan rotates at high speed once welding operation starts.

3. Installation

3.1 Installation site

(1) Locate indoors only, where the floor is capable of supporting the weight of the product.

(2) Avoid exposure to the direct sun light or the rain or water spray.
<Note> If exposed to the rain or water spray, or dew condensation occurred, dry the product before using it.

(3) Ambient temperature

(a) During welding operation: -10 °C to 40 °C
(b) During transportation/storage: -20 °C to 55 °C

(4) Humidity relative to temperature

(a) Up to 50 % at 40 °C.
(b) Up to 90 % at 20 °C.

(5) Altitude above sea level: Up to 1000 m.

(6) Spacing

(a) From the wall: 200 mm or more.
(b) Between welders installed side-by-side: 300 mm or more.

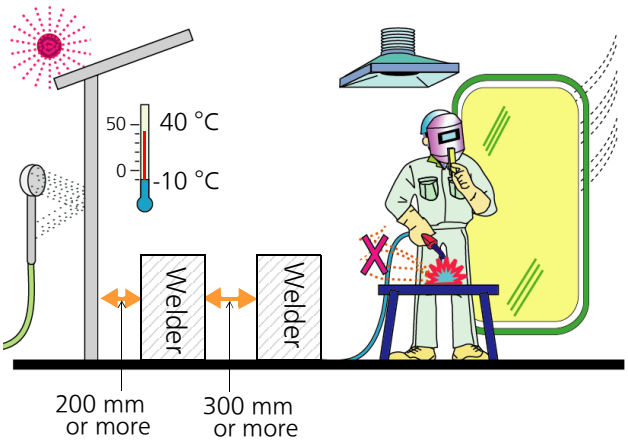
(7) Avoid wind to the arc. (Provide windshields.)

(8) Free from abnormal amounts of dust, acid, corrosive gases or substances etc. other than those generated by the welding process.

(9) Avoid places where the metallic substances or combustible foreign materials can get into the welder through the air inlets.

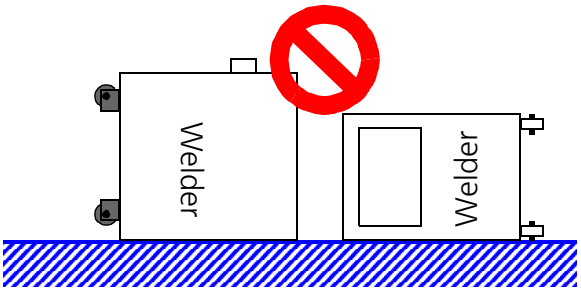
(10) Inclination to installation surface: Max 10°.
<Note> When installing the product on a inclined surface, make sure to scotch the casters. Or the casters to move unexpectedly.

(11) Do not place the product rear-side down or side-surface down to use. Placing the product in such manner will reduce the cooling effect of the machine, which will cause the malfunction or burnout of the machine. (See the figure on the right.)



Attention

When the product is installed on the floor where it is too low to operate, customers are required to prepare a table to mount the product on. Such table should be provided with flanges on the mounting surface to prevent the product to slide off the table.



3.2 Transportation

WARNING

Heavy load
Use a crane or forklift to lift up or transfer the product.

- Lifting the product by a person can cause physical injury.
- Crane and forklift must be operated by qualified personnel.

Attention

Ease the product down to the floor to avoid impact.

Attention

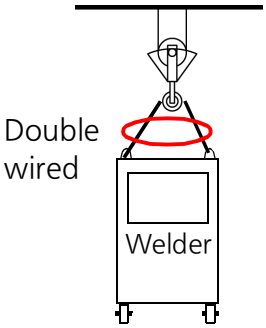
In storage, installation and transportation, do not stack the product on top of another.

Lift to transport

Make sure to set eyebolts and double wire if a crane or the like is used to lift the product.

< Note >

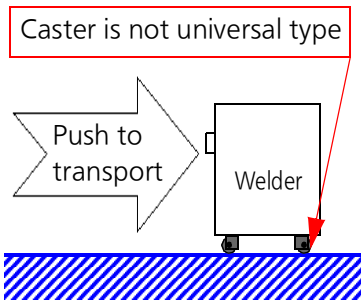
Eyebolts are important safety parts. When they are lost or broken, purchase Panasonic genuine eyebolts for your safety.
Eyebolt: Part number: XVN8FJ



To lift the welding machine by persons, lift it with more than one person.

Push to transport

- As this product is provided with casters, it is possible to push to transport the product. (Casters are not universal wheels.)



- Do not make a sharp turn, or casters or floor can be damaged.
- Do not leave the product on a slope. Topple or trundle (as the product is provided with casters) may result.

3.3 Power facilities

Model		YD-400VP1YHD
Capacity	Power	17.8 kVA or more
Input protect	Fuse	30 A
	Breaker (Leakage breaker)	30 A
Input power cable		5.5 mm^2 or 8 mm^2 AWG8 to AWG10
Grounding cable		5.5 mm^2 or 8 mm^2 AWG8 to AWG10

Note

- The above mentioned fuse and breaker capacities are reference values.
  Use the leakage breaker if the work site is highly humid, near a coast, surrounded by steel sheets or elevated structure.

- Observe the following instructions. Failure to do so can damage or burn-out the machine, or cause generation of unstable arc.
  (a) Supply stable voltage within the input voltage variation tolerance range.
  (b) Use an engine generator whose capacity is twice rated input of the welding machine, which is equipped with damper wire.

  In general, engine generator tends to require more voltage recovery time when load fluctuation occurs compared with a commercial power source. Executing arc start with insufficient capacity can lead sharp change in current. As a result, the output voltage abnormally drops and causes arc cut.
  Use of poor power source can damage the welding machine.

* About wiring of input power cable:
Make sure to prepare one power distribution box with protection function or leakage breaker to each individual welding power source.
We recommend installation of a high sensitive type leakage breaker. For any further details, please consult a breaker maker.

4. Configuration

4.1 What's needed for welding operation

To perform welding operation, it is necessary to prepare the following equipment (sold separately) other than this welding power source.

The following figure shows an configuration example. See section "4.2 Peripheral and optional equipment (sold separately)" on page 17 for details of peripheral equipment.

⚠ CAUTION

Do not install welding power source near the workpiece.
Spatter may enter inside the power source through the suction opening for cooling fans at the front and side panels, which can cause fire and burnout of internal equipment.

Information

Handling of wire feeder and welding torch

- Make sure to use this welding power source with the specified wire feeder. Otherwise, it is not possible to perform welding operation. Such wrong combination can damage equipment.
- For details including handling of wire feeder and welding torch, see operating instructions of each product.

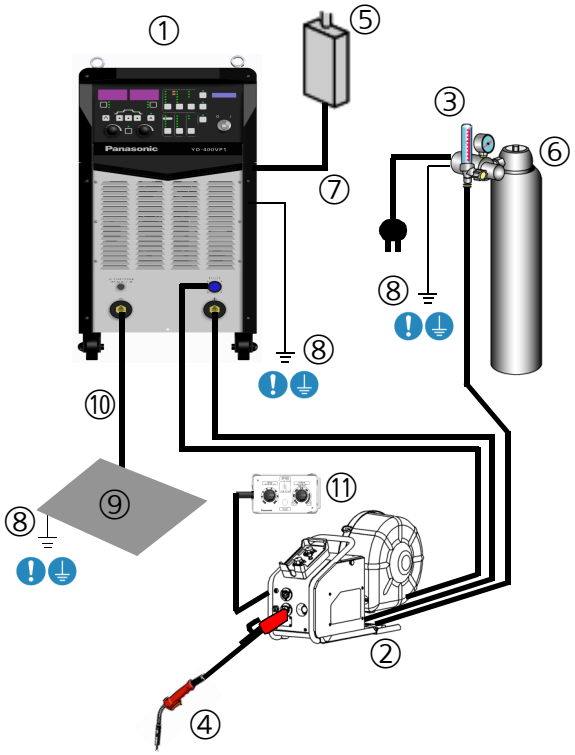
Information

Quality of applied gas is crucial as it directly affects welding quality.

- For CO_2 welding, use a carbon dioxide gas for welding or of which water contents is 0.005% or less.)
- For MAG welding, use a mixed gas for MAG welding: argon gas with 5 % to 20 % of carbon dioxide gas.
- For stainless MIG welding, use a mixed gas for stainless MIG welding: argon gas with 2 % of carbon dioxides gas.
- In case of mixing two gases (carbon dioxide and argon), use a gas mixer.
- For argon gas for the mixed gas, make sure to use high-purity argon gas for welding (99.9 % purity or higher).

4.1.1 Semi-automatic welding

An example of using air-cooled torch:

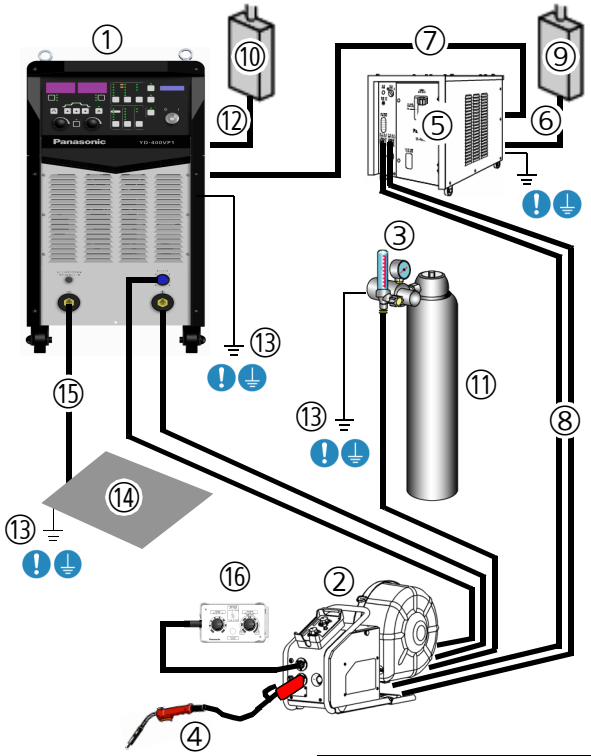


		Mild steel/stainless steel
①	Welding power source	YD-400VP1YHD
②	Wire feeder	YW-40GD2YAD
③	Gas regulator	YX-25AD1
④	Welding torch (Air cooled)	YT-35ESG4
⑤	Power distribution box	3-phase, 400 V
⑥	Gas cylinder	JIS, WES standard
⑦	Input cable	5.5 mm^2 or more
⑧	Grounding wire	5.5 mm^2 or more
⑨	Base metal	
⑩	Base metal cable	
⑪	Remote controller	YD-40GTR1(analog) YD-00DCR1(digital)

Note

The customer needs to prepare the items ② to ⑪ at their end.

An example of using water-cooled torch:



		Aluminum
①	Welding power source	YD-400VP1YHD
②	Wire feeder	YW-40DGW2YAE
③	Gas regulator	YX-503A
④	Welding torch (Water cooled)	YT-50MFW2
⑤	Water coolant	YX-09KGC1THA
⑥	Input cable	2 m, attachment to ⑤
⑦	Cord assembly	1.5 m, attachment to ⑤
⑧	Water cooling hose unit	
⑨	Power distribution box	1-phase, 400 V
⑩	Power distribution box	3-phase, 400 V
⑪	Gas cylinder	-
⑫	Input cable	5.5 mm^2 or more
⑬	Grounding wire	5.5 mm^2 or more
⑭	Base metal	
⑮	Base metal cable	
⑯	Remote controller	YD-40GTR1(analog) YD-00DCR1(digital)

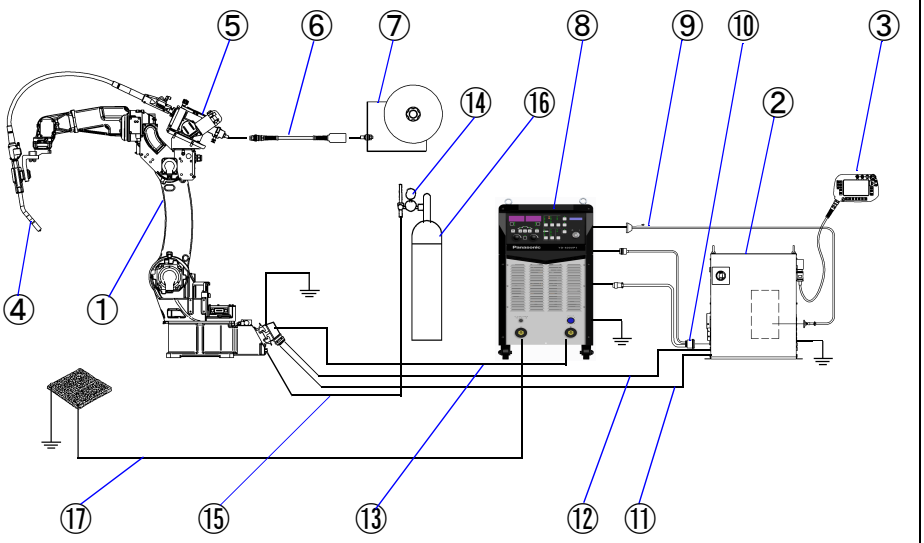
Note

The customer needs to prepare the items ② to ⑯ at their end.

4.1.2 Robotic welding

Here shows an example of robotic welding (CO_2/MAG) system. It is necessary to prepare the following equipment other than this welding power source. For robot welding, only mild steel (solid), mild steel FCW, stainless steel (solid) and stainless steel FCW are applicable.

No.	Product name
①	Robot manipulator
②	Robot controller
③	Teach pendant
④	Welding torch
⑤	Wire feeder(*)
⑥	Flexible conduit
⑦	Wire reel stand
⑧	Welding power source
⑨	Communication cable
⑩	Control cable
⑪	RE cable
⑫	Motor cable
⑬	Power cable
⑭	Gas regulator
⑮	Gas hose
⑯	Gas cylinder
⑰	Base metal cable



(*): As for wire feed motor, please contact Panasonic representatives. Use a one with rotary encoder.

Optional (Sold separately)	

Gas decompression sensor unit	• It detects gas decompression due to out of gas and so on. Attach it to the gas regulator.
	• Make sure to use the following contact type (buzzer is not applicable.)
	  • YX-01GA1: For CO_2 gas
	  • YX-01GD1: For Ar gas

Line-pack wire feeder	A wire feeder for line-pack. An adaptor unit* is needed separately. * Adaptor unit consists of flexible conduit, wire guide and FC support.

⚠ CAUTION

Do not install welding power source near the workpiece.

♦ Spatter may enter inside the power source through the suction opening for cooling fans at the front and side panels, which can cause fire and burnout of internal equipment.

Information

Handling of wire feeder and welding torch

- Make sure to use this welding power source with the specified wire feeder. Otherwise, it is not possible to perform welding operation. Such wrong combination can damage equipment.
- For details including handling of wire feeder and welding torch, see operating instructions of each product.

Information

Quality of applied gas is crucial as it directly affects welding quality.

- For CO_2 welding, use a carbon dioxide gas for welding or of which water contents is 0.005% or less.)
- For MAG welding, use a mixed gas for MAG welding: argon gas with 5 % to 20 % of carbon dioxide gas.
- In case of mixing two gases (carbon dioxide and argon), use a gas mixer.
- For argon gas for the mixed gas, make sure to use high-purity argon gas for welding (99.9 % purity or higher).

4.2 Peripheral and optional equipment (sold separately)

4.2.1 Wire feeder

	Mild steel/Stainless steel (Air-cooled)	Aluminum (Water-cooled)
Model number	YW-40DG2YAD	YW-40DGW2YAE
Drive method	Two drive rolls	Four drive rolls
Applicable wired dia. (mm)	1.0, 1.2	1.2, 1.6
Spool shaft	With brake	With brake

To use a wire diameter other than the applicable one, an optional part (sold separately) is needed.

4.2.2 Welding torch

		Mild steel/Stainless steel (Air-cooled)	Aluminum (Water-cooled)
Model number		YT-35ESG4	YT-50MFW2
Rated current		350 A	500 A
Applicable wire type		Mild steel/ (Stainless steel)	Aluminum/ (Mild steel/Stainless steel)
Applicable wire dia. (mm)		1.2	1.6
Cable length		3 m	3 m
Cooling method		Air-cooled	Water-cooled
Duty cycle (%)	CO_2	300 A: 60 %, 350 A: 45 %	(500 A: 100 %)
	MAG	350 A: 35 %	(450 A: 100 %, 500 A: 80 %)
	MIG	(350 A: 35 %)	450 A: 100 %, 500 A: 80 %
	Pulsed MAG	350 A: 20 %	(500 A: 60 %)
	Pulsed MIG	(350 A: 10 %)	500 A : 60 %

- To apply a welding process or wire type indicated in brackets (), an optional part (sold separately) is needed. If the optional part is not used, the torch wears significantly.
- To use a wire diameter other than the applicable one, an optional part (sold separately) is needed.
- Use of a wire other than the specified diameter or an elongated wire (over 3 m) can cause trouble in wire feed performance as a result, arc becomes unstable.
- To use a water cooled welding torch, the water coolant and the water cooling hose unit are needed (sold separately).

4.2.3 Gas regulator

- Model No.: YX-25AD1 (For CO_2/MAG/MIG)
- Model No.: YX-503A (For MIG)

4.2.4 Base metal voltage detection wire

- Model No.: DWU35317

4.2.5 Remote controller

- Model No.: YD-40GTR1
- Model No.: YD-00DCR(Digital remote controller)

< Note >
To use the digital remote controller with this torch, parts of the usage are different from the instruction in the operating instruction of the digital remote controller. Therefore, make sure to read “6.3.2 Digital remote controller”on page 45 prior to use.

4.2.6 Water coolant

- Model No.: YX-09KGC1THA

4.2.7 Welding table expansion unit

This unit is to add a welding table that contains welding characteristics.

Model number	Welding process	Wire material	Wire size	Model
YX-PDP004	CO2/MAG	Mild solid steel	1.6 mm	YD-400VP1YHD

Note
Welding table expansion unit is applicable from the software version 2.00 or later.
To check the current software version, please refer to "7.1.1 Operation flow" on page 60.

4.2.8 Connection cable

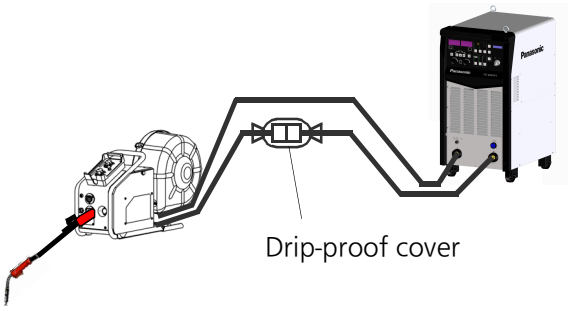
Attention

Usage notes of a connection cable

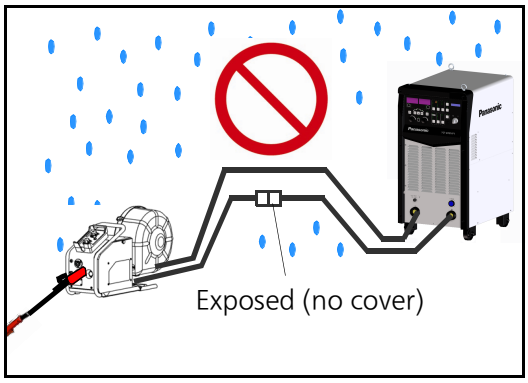
- Keep it as stubby as possible. Do not connect a unnecessarily long cable.
- Do not use the connection cable coiled or sagged. Keep it as straight as possible. Otherwise, arc may become unstable.

- Using a connection cable between the output terminal (+) of the welding power source and the wire feeder can expand the work envelope. (To that end, the base metal cable needs to be extended except special work type, such as elongated workpiece.
- Make sure to use a proper connection cable. Voltage drop can adversely affect welding results. The longer the connection cable or the smaller the cable diameter is, the larger the negative affect becomes.

Note



- Do not expose the connection portion of the extension cable to water. If such could be the case, wrap the connection portion with a drip-proof cover. If water enters in the connector portion, insulation between terminals deteriorates, which can cause an error, such as failure to turn off the output or malfunction of the welding power source.
- Protect the wire feeder with a waterproof cover.



Mild steel/Stainless steel

Cross section	Distance	Connection cable Model No.
60 mm^2	5 m	YV-605GB2A
	10 m	YV-610GB2A
	15 m	YV-615GB2A
	20 m	YV-620GB2A
80 mm^2	5 m	YV-805GB2A
	10 m	YV-810GB2A
	15 m	YV-815GB2A
	20 m	YV-820GB2A

Aluminum

Cross section	Distance	Connection cable Model No.
60 mm^2	5 m	YV-605GE2A
	10 m	YV-610GE2A
	15 m	YV-615GE2A
	20 m	YV-620GE2A

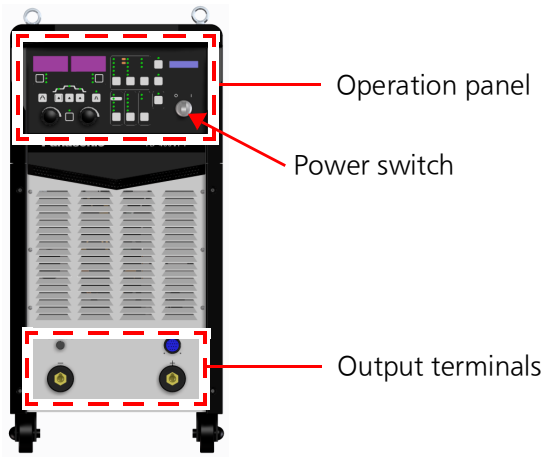
Water cooling hose

Extension distance	Connection cable Model No.
5 m	YV-005GE2W
10 m	YV-010GE2W
15 m	YV-015GE2W
20 m	YV-020GE2W

Note

- Do not connect connection cables to each other. Use only one connection cable at a place.
- Select a cable suitable to the environment of customers' usage.
- Connection cable unit consists of a power cable, a control cable and a gas hose cable.
- Use Panasonic genuine connection cable without fail. Otherwise, cables may burn out.
- For cable size other than the above table, please contact Panasonic representatives.

5. Names and functions



5.1 Power switch

⚠ WARNING

If switching the power switch to the on side does not turn on power to the unit, contact Panasonic representatives.

- It turns ON/OFF power to the welding power source.
- Once power is turned on, the power LED on the operation panel is turned on and the software version is displayed. (For details, see section "7.1.1 Operation flow" on page 60.)

Note

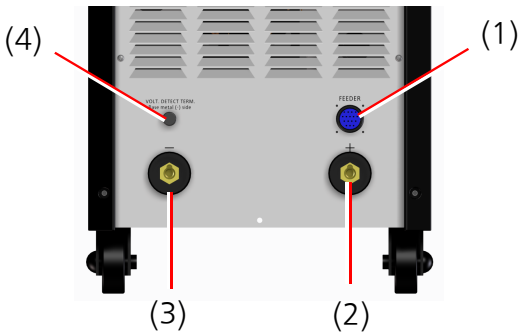
- The cooling fan starts its rotation in 13 seconds after turning on the power switch.
- The cooling fan rotates at low speed in the standby state.
- The cooling fan stops its rotation to conserve energy if the standby state continues for 7 minutes or longer.
- The cooling fan rotates at high speed once welding operation starts.

5.2 Output terminals

⚠ WARNING

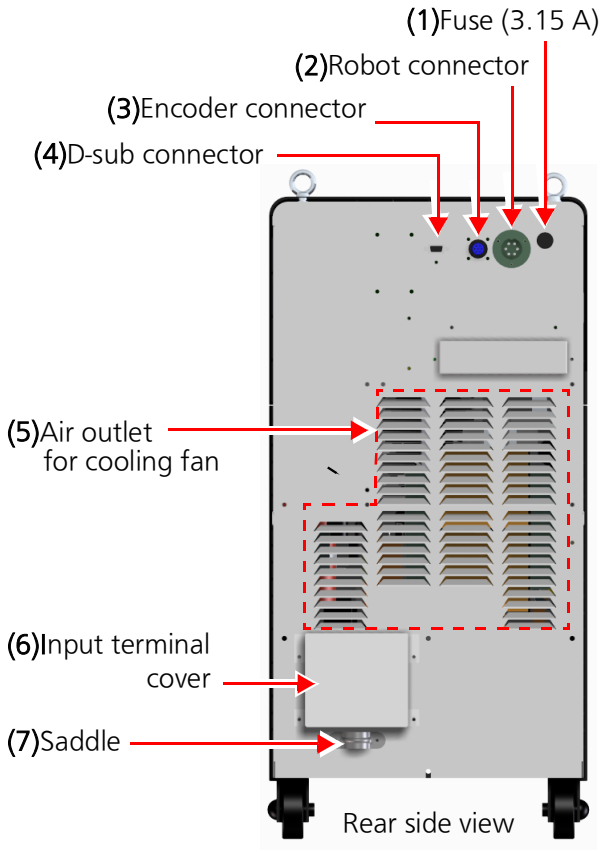
- Prior to connection and disconnection works, turn off power at the power distribution box to prevent electrical shock and malfunction.
- After the connection work, put the output terminal cover back in place and fix it with the bolt.

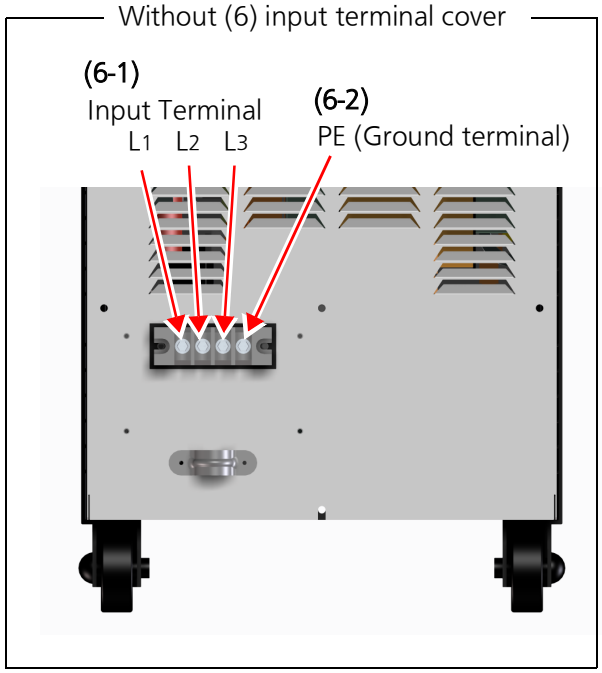
5.2.1 Terminal name



(1)	**Feeder connector** Connect control cable connector of the wire feeder.
(2)	**Torch (+) output terminal** Connect power cable of the wire feeder. *For robot welding, connect to the power cable of the manipulator.
(3)	**Base metal (-) output terminal** Connect base metal cable.
(4)	**Base metal voltage detection terminal** Connect base metal voltage detection wire as needed.

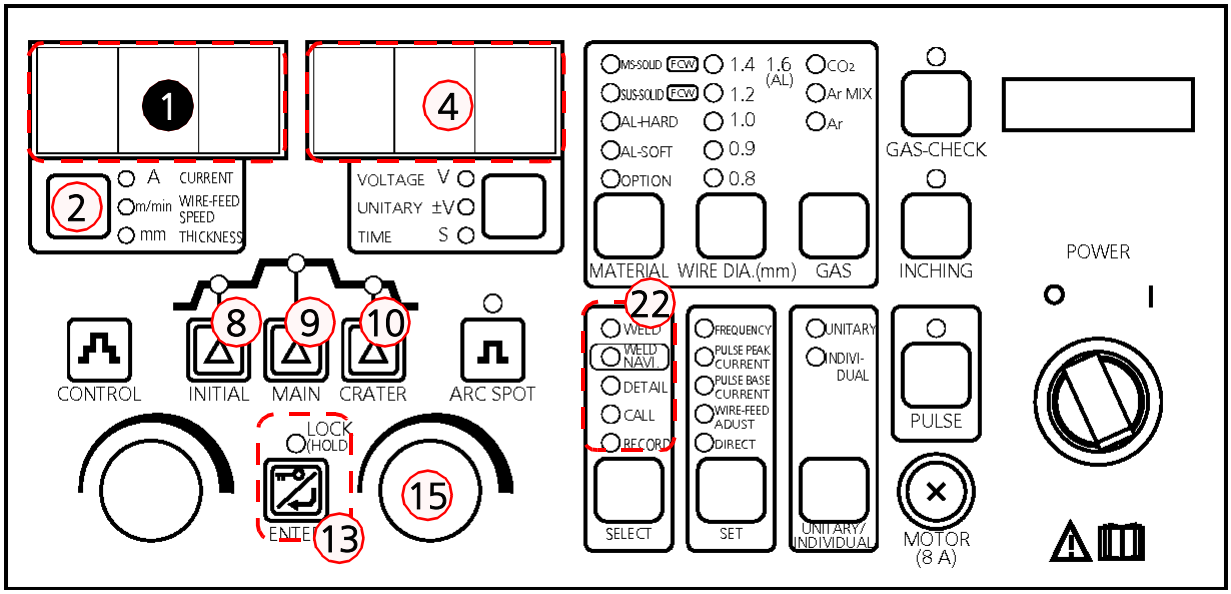
5.3 Rear side panel

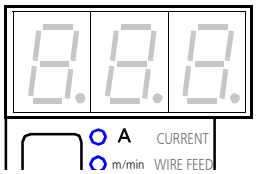


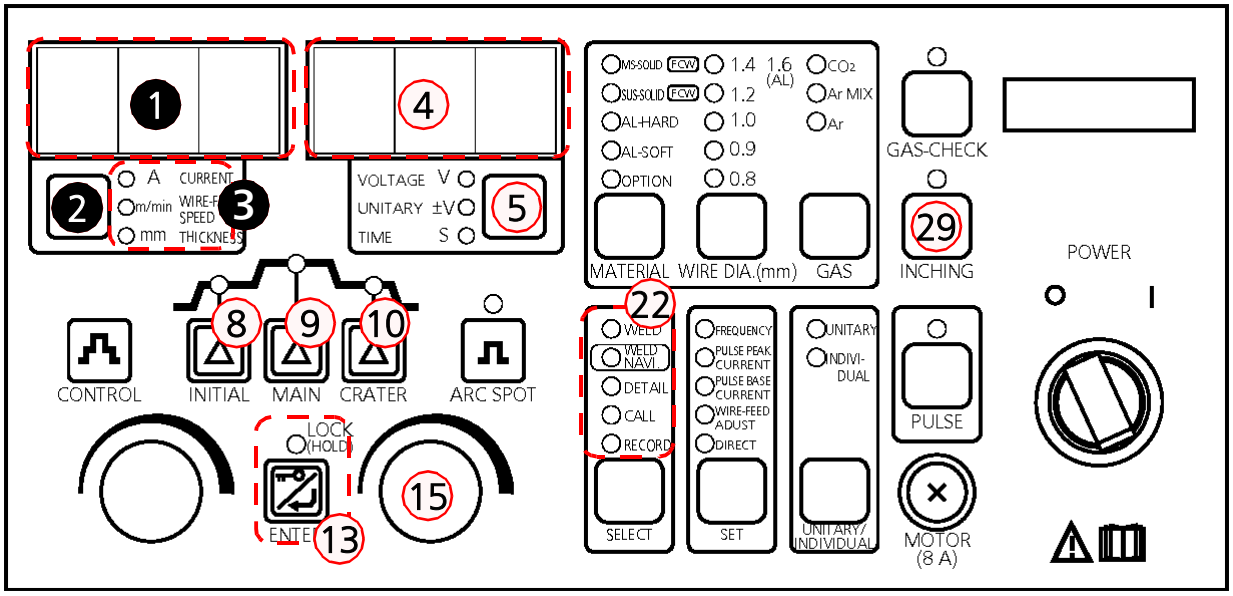


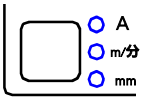
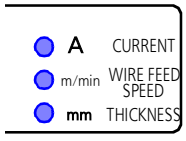
<Connectors for robot connection>	
(1)	**Fuse (3.15 A)** A fuse for welding voltage detection.
(2)	**Robot connector** Connect a control cable.
(3)	**Encoder connector** Connect a control cable to receive encoder signal from the wire feeder motor.
(4)	**D-sub connector** Connect a communication cable to receive digital signal.
(5)	**Air outlet for cooling fan** Openings in the front and side panels are the suction openings. **Note** Once the power switch is turned on, the cooling fan starts to rotate. The fan stops its rotation if the welding power source stays in the standby state for 7 minutes or longer to conserve energy. The fan is reactivated the next time welding operation is started.
(6)	**Input terminal cover** Remove it to connect input terminals and ground terminal. **Note** After connecting the cables, fix the saddle and then put the input terminal cover back in place.
(6-1)	**Input terminals (L1(U), L2(V), L3(W))** Remove the input terminal cover to access.
(6-2)	**Ground terminal (PE)** Remove the input terminal cover to access. *Connect the grounding wire without fail.
(7)	**Saddle** Make sure to connect the input cable (L1(U), L2(V), L3(W)) and grounding wire (PE) through the saddle to the input terminals. After connecting the cable, fix the saddle tight enough not to loose the input cable. **Note** After fixing the saddle, put the input terminal cover back in place and fix it with screws.

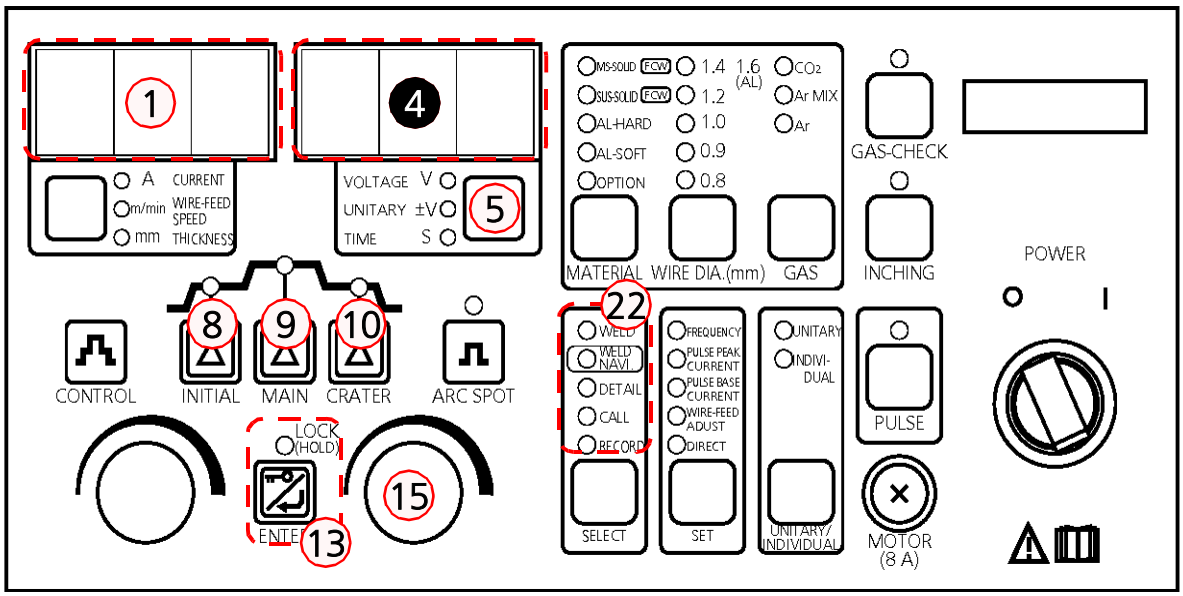
5.4 Operation panel

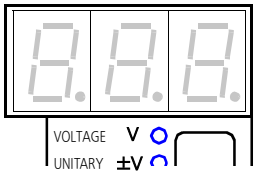


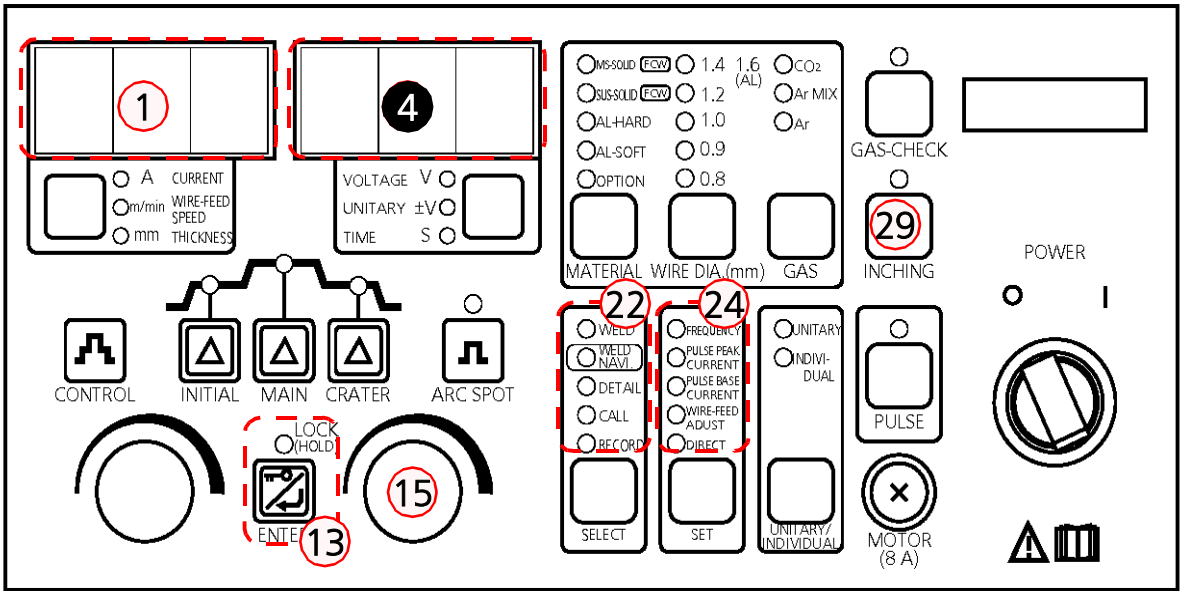
No.	Name	Functions
1	Output/Setting display1 	When Mode indicator (㉒) "WELD" is lit: • It indicates the set value (current, wire feed speed or thickness) of the item selected by Output/Setting display1 select button (②) in Initial (⑧), Main (⑨) or Crater (⑩) welding operation. • While welding, it indicates output current. • After completing welding operation, the last output value blinks on the display. • If there is no welding table, the displays indicate "- - -".
		When Mode indicator (㉒) "WELD NAVI." (see page 77) is lit: • It shows "- - -".
		When Mode indicator (㉒) "DETAIL" (see page 82) is lit: • It indicates setting group number and setting submenu. At that time, Output/Setting display 2 (④) indicates its set value.
		When Mode indicator (㉒) "CALL" (see page 120) is lit: • Immediately after switching to CALL mode, or when oFF is selected using Dial 2 (⑮), it indicates the current set current and "- - -" alternately. At that time, it is possible to perform welding operation using the current welding condition. • After selecting a channel using Dial 2 (⑮), it indicates the called current value and "CH-" alternately. • While welding, it indicates the output current. • After completing welding operation, the last output value blinks on the display.



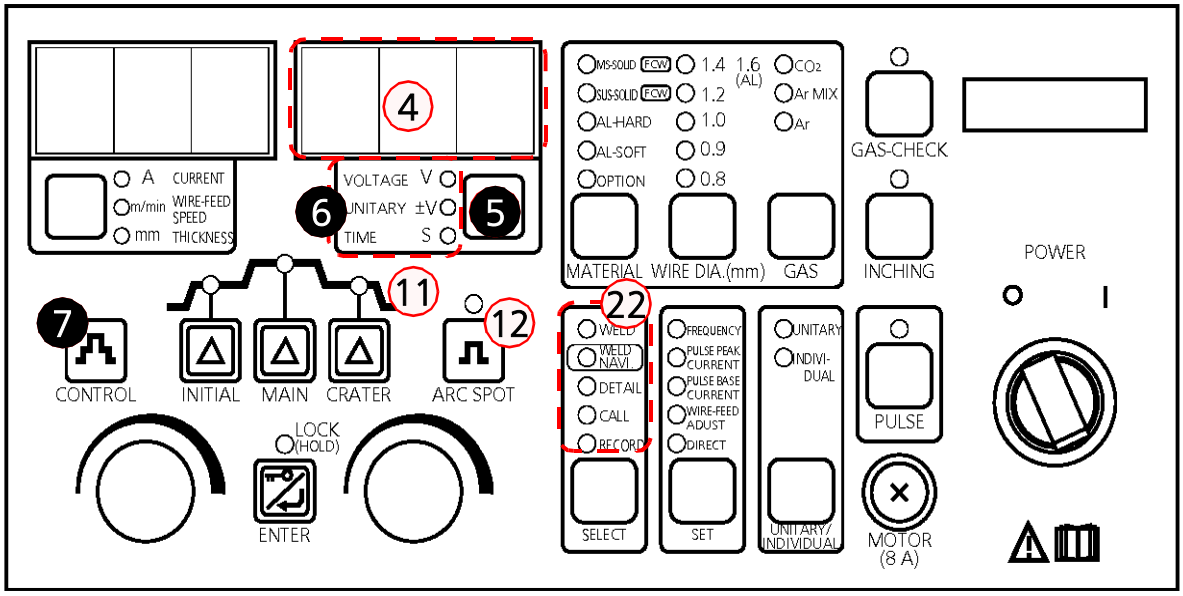
No.	Name	Functions
1	Output/Setting display1	When Mode indicator (㉒) "RECORD" (see page 117 page) is lit: • Immediately after switching to RECORD mode, or when oFF is selected using Dial 2 (⑮), it indicates the current set value and "- - -" alternately. • After selecting a channel using Dial 2 (⑮), it indicates the current set value and "CH-" alternately. • Select a channel and press ENTER (⑬), then it indicates "rEC". Then, select RECORD no, yES or dEL. • Select "yES" to enter a channel name. At that time, the display indicates "rEC".
		While holding down INCHING button (㉙), and when Mode indicator (㉒) "WELD NAVI.", "DETAIL" or "RECORD" is selected, the display indicates "no". At that time, Output/Setting display 2 (④) indicates "Act" (put two displays together, they indicate "no act") and the inching operation is disabled.
		In case a self diagnosable error occurs: • The "Err" blinks on the display. At that time, the error number that indicates the error contents blinks on Output/Setting display 2 (④).
2	Output/Setting display1 select button 	Use it to select current, wire feed speed or thickness. Press the button until the LED of the intended Output/Setting display 1 item indicator (③) is lit. Then the set value of the selected item is indicated on the Output/Setting display 1 (①).
3	Output/Setting display1 item indicator 	When Mode indicator (㉒) "WELD", "CALL" or "RECORD" is lit. (See pages 120 and 117): • The LED of Output/Setting display 1 item indicator (③) selected by Output/Setting display 1 select button (②) is lit.
		When Mode indicator (㉒) "WELD NAVI." or "DETAIL" is lit. (See page 77 and 82): • LED is turned off.

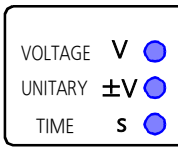


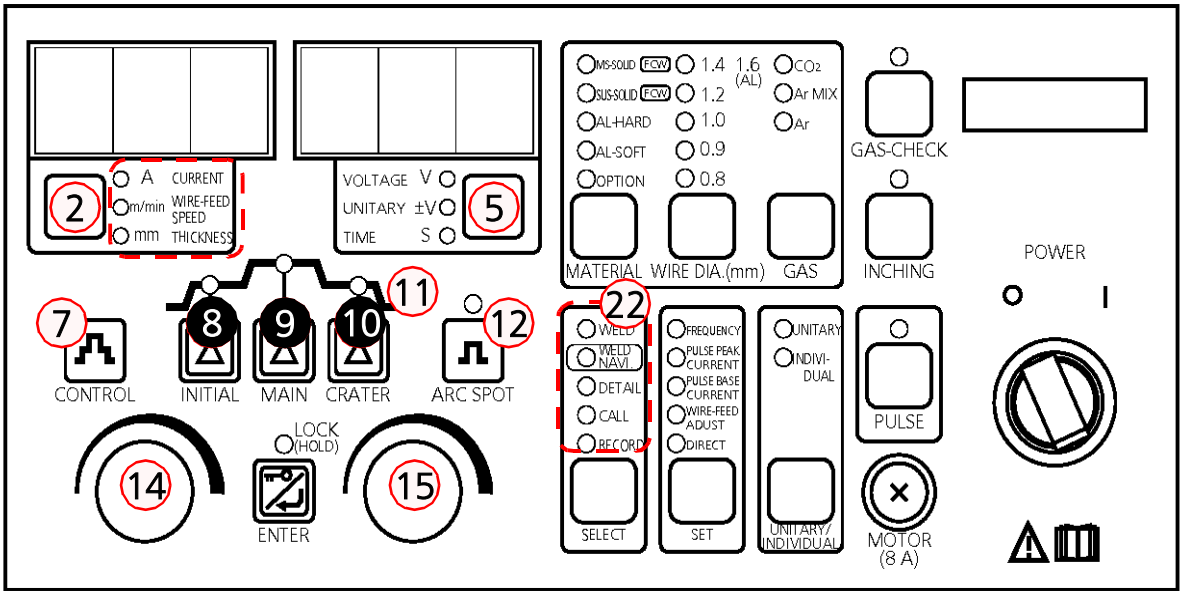
No.	Name	Functions
4	Output/Setting display2  	When Mode indicator (㉒) "WELD" is lit: • It indicates the set value of the item (voltage, adjusting value based on unitary condition, or arc spot time (only when the arc spot is set)) selected by Output/Setting display2 select button (⑤) in Initial (⑧), Main (⑨) or Crater (⑩) welding operation. • While welding, it indicates the output voltage. • After completing welding operation, the last output value blinks on the display. • If there is no welding table, the displays indicate "- - -"
		When Mode indicator (㉒) WELD NAVI."(see page 77) is lit: Conditions of joint shape, thickness and welding speed are indicated. It also indicates "rEt" to move to the previous item.
		When Mode indicator (㉒) "DETAIL" (see page 82) is lit: It indicates the set value of the selected item. At that time, Output/Setting display 1 (①) indicates setting group number and setting submenu.
		When Mode indicator (㉒) "CALL" (see page 120) is lit: • Immediately after switching to CALL mode, or when oFF is selected using Dial 2 (⑮), it indicates the current set voltage and "- - -" alternately. At that time, it is possible to perform welding operation using the current welding condition. • After selecting a channel using Dial 2 (⑮), it indicates the called voltage value and "CH-" alternately. • While welding, it indicates the output current. • After completing welding operation, the last output value blinks on the display.



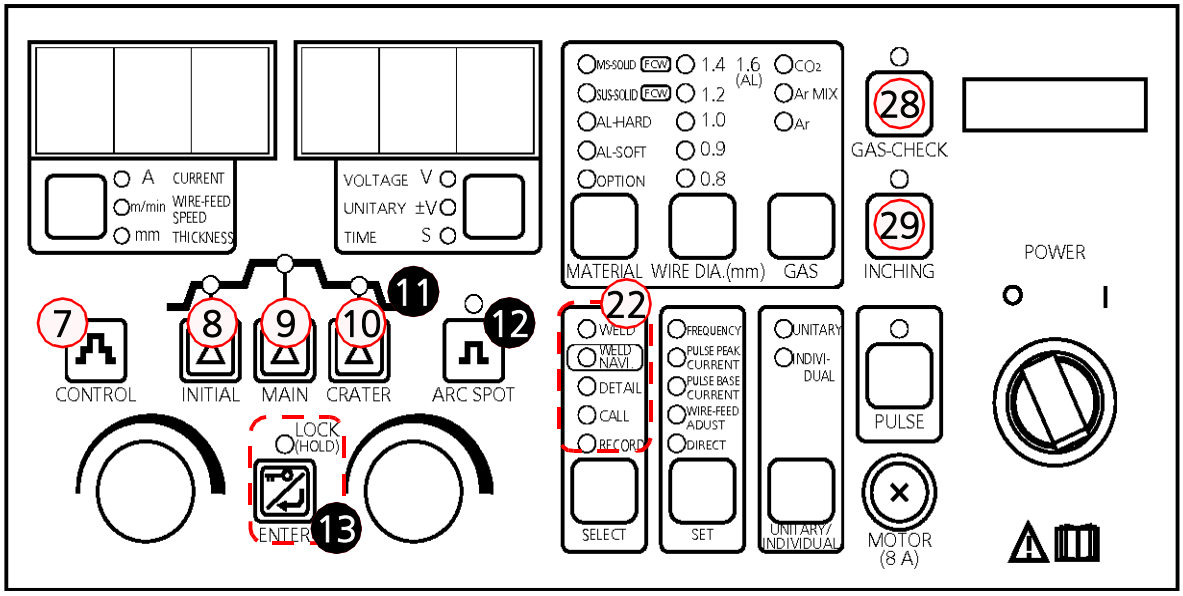
No.	Name	Functions
4	Output/Setting display2	When Mode indicator (㉒) "RECORD" is lit (see page 117 page): • Immediately after switching to RECORD mode, or when oFF is selected using Dial 2 (⑮), it indicates the voltage set value and "oFF" alternately. • After selecting a channel using Dial 2 (⑮), it indicates the voltage value for storage and the selected channel number alternately. • Select a channel and press ENTER (⑬), then it indicates "no". By further changing the channel with Dial 2 (⑮), it changes the indication from "no" to "yES" to "dEL" and back to "no". • Select "yES" to enter a channel name. At that time, the display indicates a 3-digit channel number.
		When Setting indicator (㉔) "FREQUENCY", "PULSE PEAK CURRENT", "PULSE BASE CURRENT" or "WIRE-FEED ADJUST" is lit: • It indicates the set value of the wave control or wire-feed adjustment. • Use Dial 2(⑮) to set.
		When Setting indicator (㉔) "DIRECT" (see page 126) is lit: • It indicates the set value of the selected item. • While switching items in DIRECT function, it indicates the submenu number.
		While holding down INCHING (㉙) button, and when Mode indicator (㉒) "WELD NAVI.", "DETAIL" or "RECORD" are selected, it indicates "Act". At that time, Output/Setting display 1 (①) indicates "no". The inching operation is disabled.
		In case a self diagnosable error occurs: The "error number" that indicates the error contents blinks on the display. At that time, the "Err" blinks on Output/Setting display 1 (①).

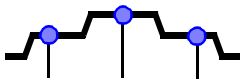
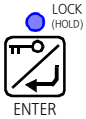


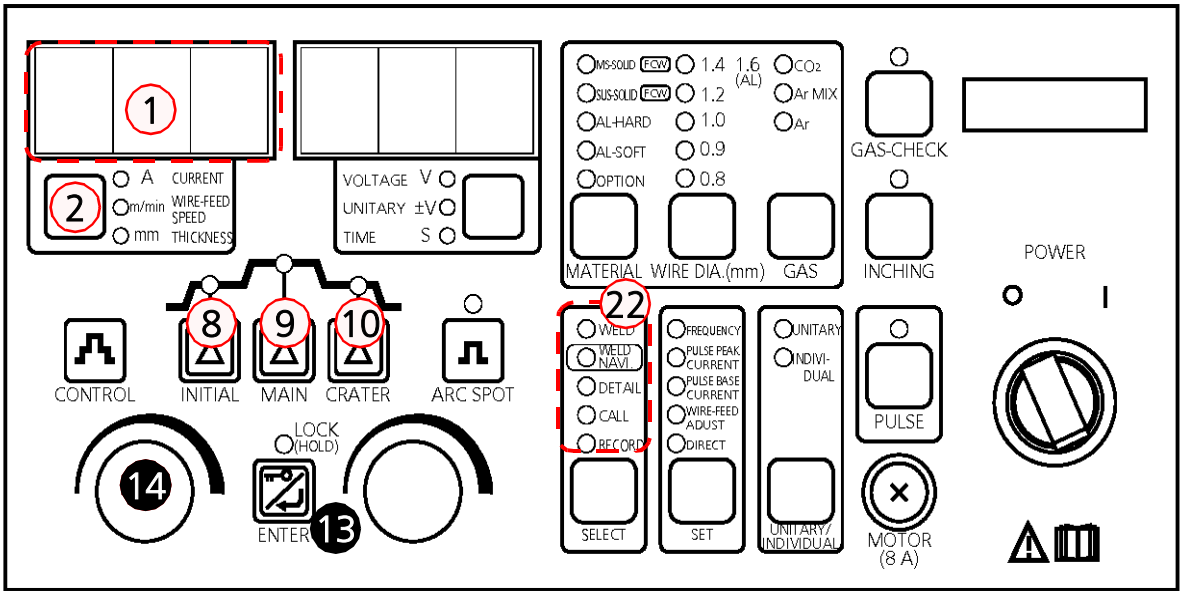
No.	Name	Functions
5	Output/Setting display2 select button 	Use it to select voltage setting value, voltage adjusting value based on unitary condition, or arc spot time. • Press the button until the LED of the intended Output/Setting display 2 item indicator (⑥) is lit. Then the set value of the selected item is indicated on the Output/Setting display 2 (④). • "Arc spot time" is selectable only when arc spot is set by pressing the [ARC SPOT] button (⑫).
6	Output/Setting display2 item indicator 	When Mode indicator (㉒) "WELD", "CALL" or "RECORD" (see pages 120 and 117) is lit: • The LED selected by Output/Setting display 2 select button (⑤) is lit.
		When Mode indicator (㉒) "WELD NAVI." or "DETAIL" (see page 77 and 82) is lit: • LED is turned off.
7	Control process select button [CONTROL] 	Use it to select "No crater", "Crater" or "Ini.&Crater". • As you select a control process, the LEDs of Control process indicator (⑪) are lit as follows.  No crater  Crater  Ini. & Crater **Note** In "Crater" or "Ini. & Crater" settings, if you want to perform crater welding with no pulse, it is necessary to switch the "PULSE BASE CUR" settings (The submenu 08 of Group 1 "Welding parameters" in DETAIL mode. (See page 82).



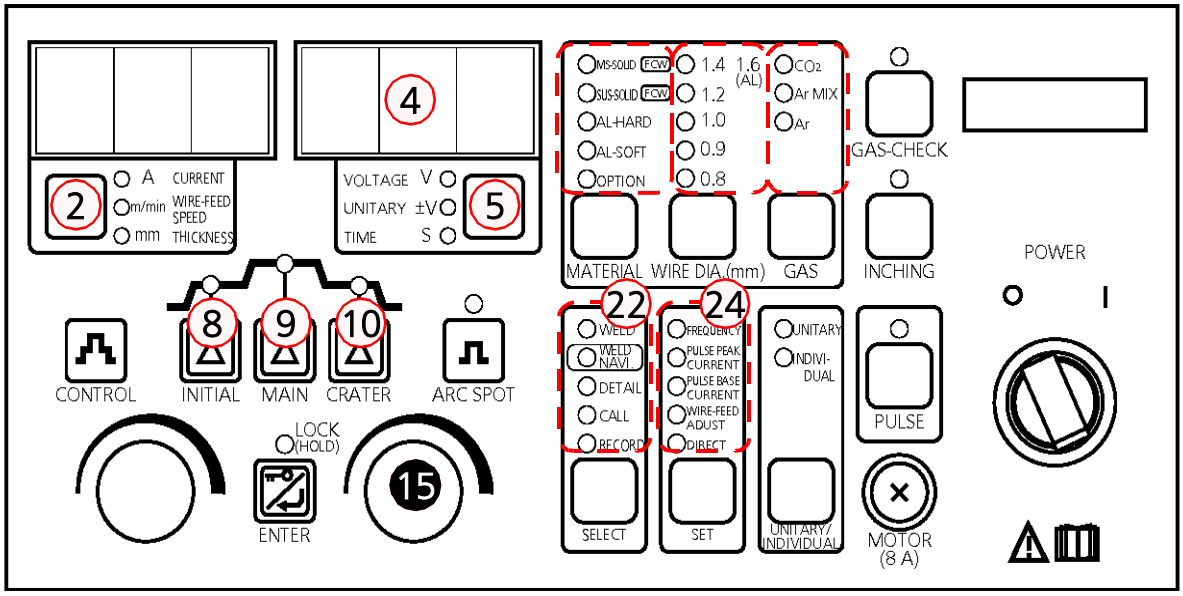
No.	Name	Functions
8	Initial current [INITIAL] button 	When Mode indicator (㉒) "WELD" is lit and the selected control process is "Ini.&Crater", use it to specify or change the initial condition. • For each LED of Control process indicator (⑪) over this [INITIAL] button (⑧) - LED is on, the condition is set - LED blinks, condition is changeable (Use Output/Setting indicator1 select button (②), Output/Setting indicator2 select button (⑤), Dial 1(⑭) and Dial 2 (⑮) to specify the initial condition.)
9	Main welding [MAIN] button 	When Mode indicator (㉒) for WELD is lit and the selected control process is "Main welding", use it to specify or change the main welding condition. • For each LED of Control process indicator (⑪) over this [MAIN] button (⑨) - LED is on, the condition is set - LED blinks, condition is changeable (Use Output/Setting indicator1 select button (②), Output/Setting indicator2 select button (⑤), Dial 1(⑭) and Dial 2 (⑮) to specify the main welding condition.)
10	Crater welding [CRATER] button 	When Mode indicator (㉒) "WELD" is lit and the selected control process is "Crater" or "Ini.&Crater", use it to specify or change the crater condition. • For each LED of Control process indicator (⑪) over this [CRATER] button (⑩) - LED is on, the condition is set - LED blinks, condition is changeable (Use Output/Setting indicator1 select button (②), Output/Setting indicator2 select button (⑤), Dial 1(⑭) and Dial 2 (⑮) to specify the crater condition.)



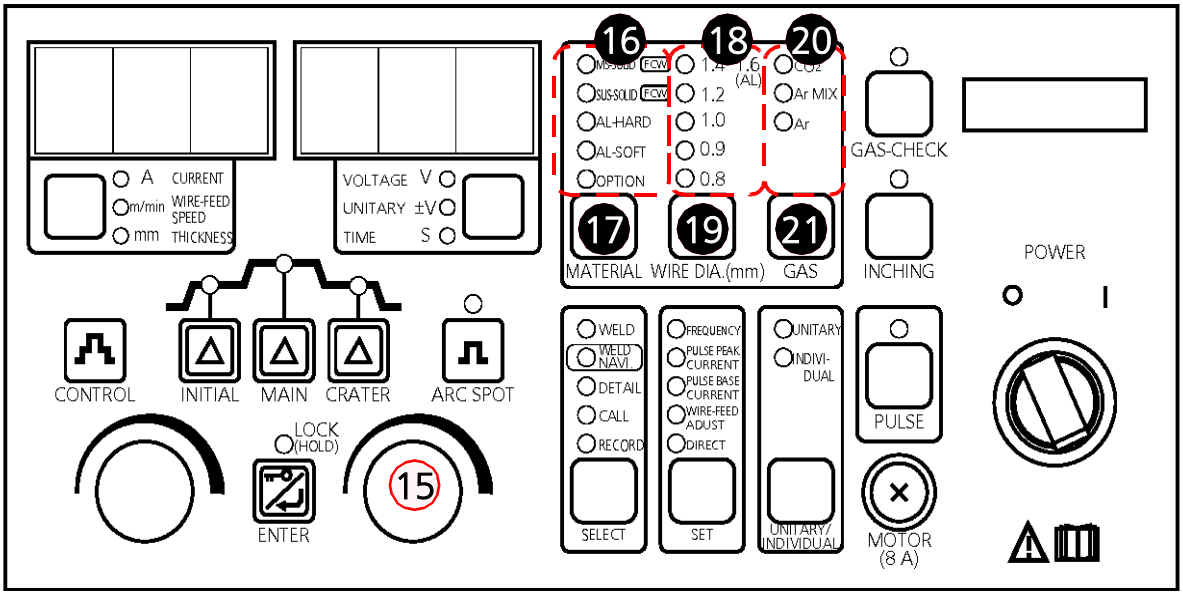
No.	Name	Functions
11	Control process indicator  [INITIAL] [MAIN] [CRATER]	It indicates control process. • Specified combination of LEDs are lit according to the control process (“No crater”, “Crater” or “Ini.&Crater”) set by [CONTROL] button (⑦). • If the [ARC SPOT] button (⑫) is pressed to use the arc spot, only the LED for [MAIN] (⑨) is lit. • When [INITIAL] (⑧), [MAIN] (⑨) or [CRATER](⑩) button is pressed to change conditions, corresponding LED blinks.
12	Arc spot indicator&button  ARC SPOT	Use it to set arc spot. • LED is off: No Arc spot • LED is on: Arc spot is applicable (Then, LED (⑪) for [MAIN] (⑨) is turned on.)
13	Operation lock indicator&button [LOCK]/ Enter button [ENTER]  LOCK (HOLD) ENTER	Use it to lock the operation. • Long press of the button lights the LED above the button and locks the operation. • Long pressing again to turn off the LED and release the lock state. • While locking the operation, all buttons and dials except GAS-CHECK (㉘) and INCHING (㉙) buttons do not function.
		When Mode indicator (㉒) “WELD” is lit: • The button is disabled.
		When Mode indicator (㉒) “WELD NAVI.” (see page 77) is lit: • Use it to set the condition of the selected joint shape, thickness and wire feed speed.
		When Mode indicator (㉒) “DETAIL” (see page 82) is lit: • Use it to set the selected group number and submenu number. • Use it to set the specified set value.

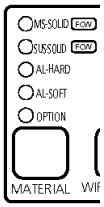
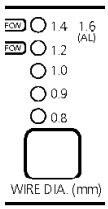
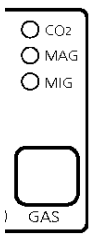


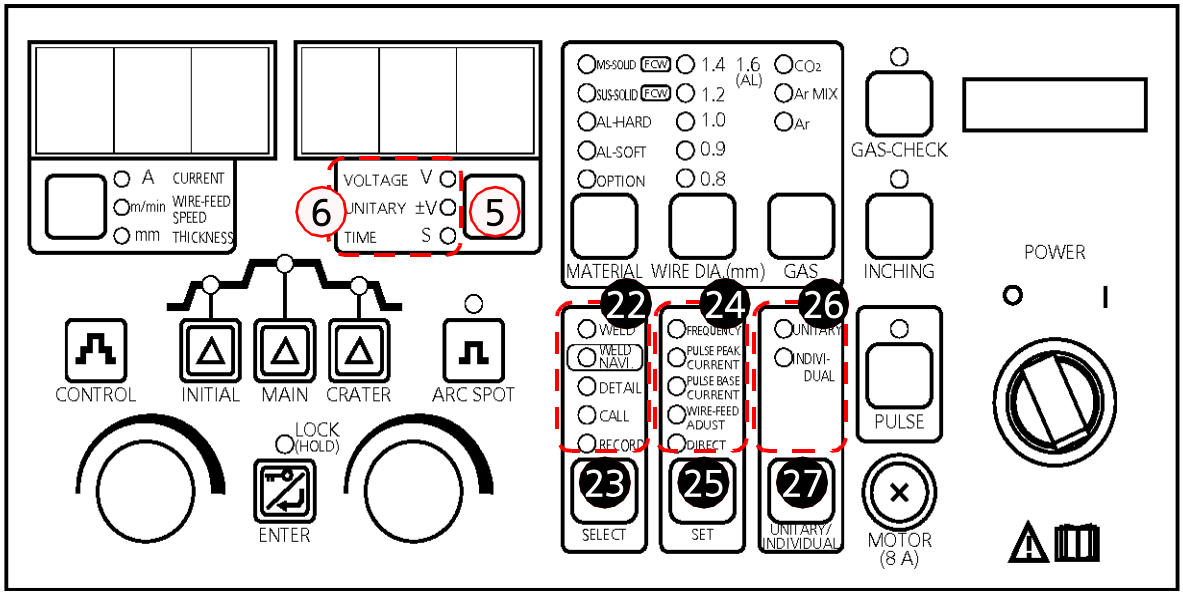
No.	Name	Functions
13	Operation lock indicator&button [LOCK]/ Enter button [ENTER]	When Mode indicator (㉒) "CALL" (see page 120) is lit: • Use it to set the channel to call.
		When Mode indicator (㉒) "RECORD" (see page 117) is lit: • Use it to set the channel to record or delete. • Use it to enter the channel name.
		When Settings indicator (㉒) "DIRECT" (see page 126) is lit: • Use it to set the submenu number while changing the direct items.
14	Dial 1 (For Output/Setting display1)	Use it to change the value displayed on the Output/Setting display1 (①).
		When Mode indicator (㉒) "WELD" is lit: • Use it to specify the set value of the item (current, wire-feed speed or thickness) selected by Output/Setting display1 select button (②) in Initial (⑧), Main (⑨) or Crater (⑩) welding operation. • In case "ANALOG RC" setting is set to "With the remote controller", use the remote controller to set the system (see section "8.6 Group3: SYSTEM settings" on page 104.) • The setting is changeable while welding.
		When Mode indicator (㉒) "DETAIL" is lit: Use it to set the group number and submenu number of DETAIL menu.
		When Mode indicator (㉒) "WELD NAVI., "CALL" or "RECORD" (see pages 77, 120 or 117) is lit: • Do not use it.

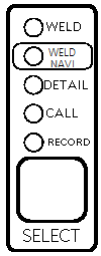
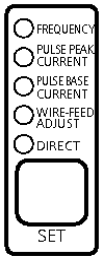
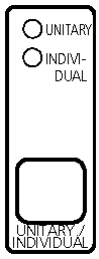


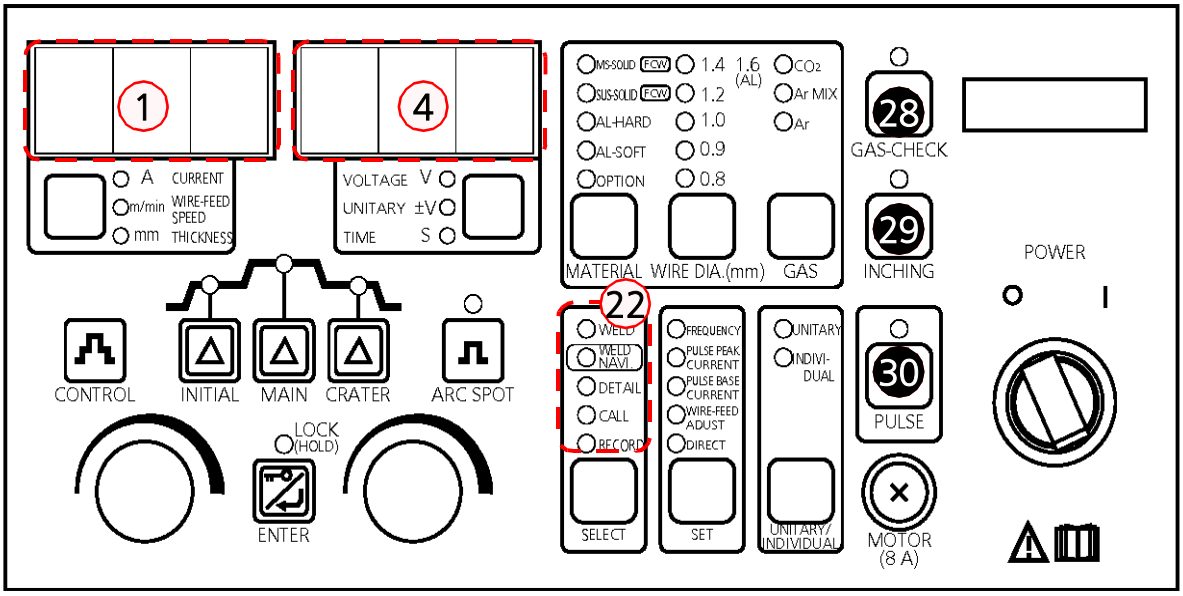
No.	Name	Functions
15	Dial 2 (For Output/Setting display2) 	Use it to change the value displayed on the Output/Setting display2 (②). When Mode indicator (㉒) "WELD" is lit: • Use it to specify the set value of the item (voltage, voltage adjusting value based on unitary condition, or arc spot time (only when the arc spot is set)) selected by Output/Setting display2 select button (⑤) in Initial (⑧), Main (⑨) or Crater (⑩) welding operation. • If "ANALOG RC" setting is set to "With the remote controller", use the remote controller to set the system (see section "8.6 Group3: SYSTEM settings" on page 104.) • The setting is changeable while welding. When Mode indicator (㉒) "WELD NAVI."(see page 77) is lit: • Use it to set the joint shape, wire-feed speed and thickness. When Mode indicator (㉒) "DETAIL" (see page 82) is lit: • Use it to specify the set value of the selected item. When Mode indicator (㉒) "CALL" (see page 120) is lit: • Use it to select the channel number to call. (Only recorded channel numbers are indicated on Output/Settings indicator 2 (④). When Mode indicator (㉒) "RECORD" (see page 117) is lit: • Use it to select a channel and then select the intended action (no) for do not record, (yES) for record, or (dEL) for delete. • Use it to select a channel number. When Settings indicator (㉔) "WAVE CONTROL" or "WIRE-FEED ADJUST" is lit: • Use it to adjust the set value of WAVE CONTROL or WIRE-FEED ADJUST. When Settings indicator (㉔) "DIRECT" (see page 126) is lit: • Use it to select a submenu number while changing an item in DIRECT function. • Use it to adjust a set value while using DIRECT function.

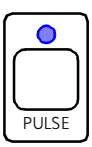


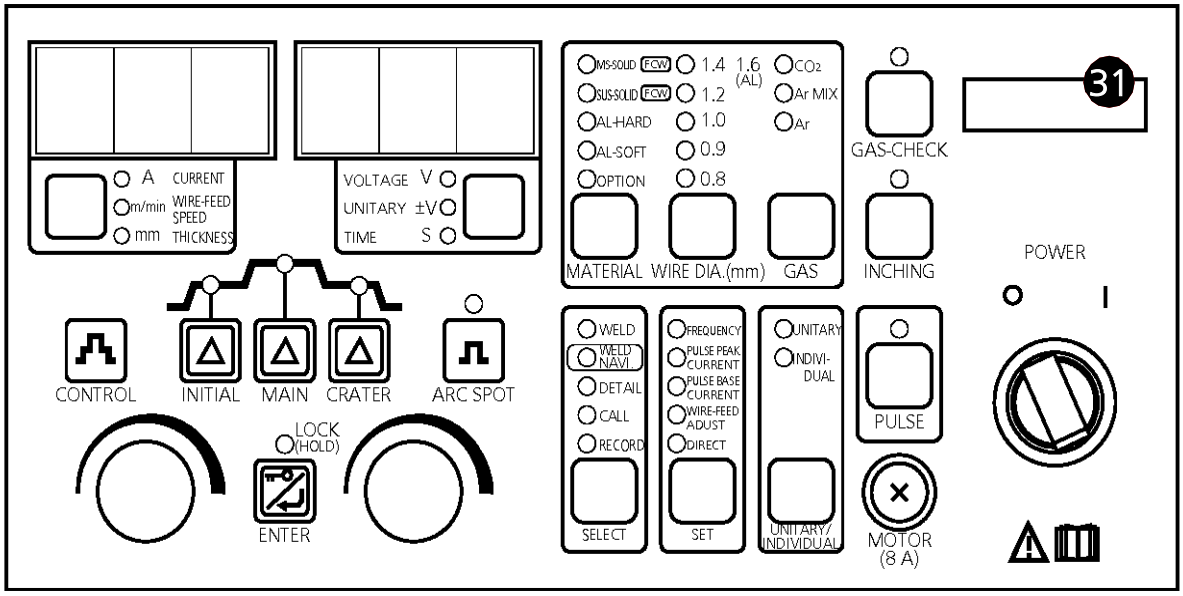
No.	Name		Functions
16	Material indicator		It indicates the wire material to be applied. (FCW represents flux cored wire) • The LED corresponding to the wire material selected by MATERIAL select button (⑰) is lit. For “mild steel (MS)” and “stainless steel (SUS)”, LED is lit in green: Solid type (SOLID) is selected LED is lit in orange: Flux type (FCW) is selected. • The LED blinks if there is no welding table.
17	Material select button [MATERIAL]		Use it to select a wire material to be applied. • The LED of Material indicator (⑯) corresponding to the specified wire material is lit.
18	Wire diameter indicator		It indicates the wire diameter to be applied. • The LED corresponding to the wire diameter selected by Wire diameter select button (⑲) is lit. • The LED blinks if there is no welding table.
19	Wire diameter select button [WIRE DIA.]		Use it to select a wire diameter to be applied. • The LED of Wire diameter indicator (⑱) corresponding to the specified wire diameter is lit.
20	Welding process indicator		It indicates a welding process. • The LED corresponding to the welding process selected by Wire Welding process select button (㉑) is lit. • The LED blinks if there is no welding table.
21	Welding process select button [GAS]		Use it to select a gas type (welding process). • The LED of Welding process indicator (⑳) corresponding to the specified welding process is lit.



No.	Name		Functions
22	Mode indicator		It indicates a mode. The LED corresponding to the mode selected by mode SELECT button (㉓) is lit.
23	Mode select button [SELECT]		Use it to select a mode. The LED of Mode indicator (㉒) corresponding to the specified mode is lit.
24	Settings indicator		It indicates settings of FREQUENCY, PULSE PEAK CURRENT, PULSE BASE CURRENT, WIRE-FEED ADJUST and DIRECT functions. The LED corresponding to Settings select button (㉕) is lit. * The LED blinks while changing items of DIRECT function.
25	Settings select button [SET]		Use it to select FREQUENCY, PULSE PEAK CURRENT, PULSE BASE CURRENT, WIRE-FEED ADJUST or DIRECT function. The button is enabled only when Mode indicator (㉒) "WELD" is lit. The LED corresponding to Settings indicator (㉔) is lit. * While selecting a settings, Output/Setting display2 select button (⑤) and mode SELECT button (㉓) are disabled. All LEDs of Output/Settings display2 item indicator (⑥) are turned off.
26	Unitary/ Individual indicator		It indicates Unitary or Individual. The LED corresponding to UNITARY/INDIVIDUAL select button (㉗) is lit.
27	Unitary/ Individual select button [UNITARY/ INDIVIDUAL]		Use it to select Unitary or Individual. The LED corresponding to UNITARY/INDIVIDUAL indicator (㉖) is lit.



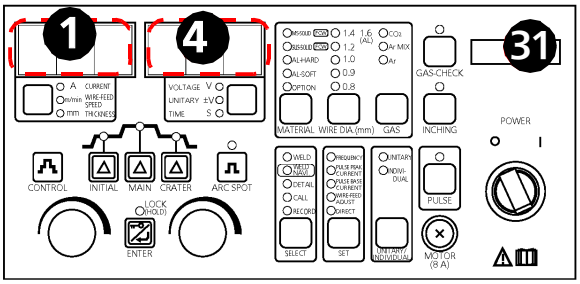
No.	Name	Functions
28	Gas check button [GAS-CHECK]  	Use it to perform gas check. • The LED above the button is lit during gas check. • Press once to flow gas. Press once again to stop gas. • In 60 seconds after starting gas check, the gas stops and the LED goes off. • Starting welding operation during gas check terminates the gas check operation. (At that time, gas flow continues.) • Gas check is applicable only in the standby state.
29	Inching button [INCHING]  	Use it to perform inching operation. < Note > Wire feed amount during inching operation varies with welding current set value. The button is applicable only when Mode indicator (㉒) "WELD" or "CALL" is lit. Starting welding operation during inching operations cancels the inching operation. At that time, the wire feed amount specified in welding sequence is applied. (If the inching button is pressed in a mode other than the above, the word "no Act" is displayed on Output/Settings displays1and 2 (① ④). • The inching operation is executed while the inching button is held down. • During inching operation, the LED above the button is lit.
30	Pulse button  	Use it to determine whether to use PULSE or not. • When PULSE is valid, the LED above the button is lit. • If the selected welding condition is not pulse applicable type, the button is disabled and the LED above the button stays OFF state. • With the use of an analog remote controller, settings of the remote controller has the priority and the button is disabled.



No.	Name	Functions
31	LCD (16 letters x 2 lines) Panasonic VP1 series	It indicates status details or set value. • In case it is set to "with ENERGY SAVING", the backlight is turned off after a specified period of time. • In case it is set to "with GUIDE LCD CTRL"(*), the backlight is lit if there is an indication on the LCD and the backlight goes off if there is no indication on the LCD. However, in case a SUB-MONITOR is set, the LCD indicates the specified monitoring item.

(*)See section "8.6.1 Setting items" on page 104.

5.4.1 Operation panel in robotic welding



- When the welding power source is connected to a robot, only Output/Settings displays 1 and 2 (① ④) and LCD (㉛) function and other LED are turned off.
- When the welding power source is connected to a robot, all buttons and dials on the operation panel are disabled. Use teach pendant of the controller.

5.5 Switches on the P.C. Board

Switches on the control board are

- to expand the functions of the product, and
- to connect optionals.

Normally, keep the default switch settings.

⚠ WARNING

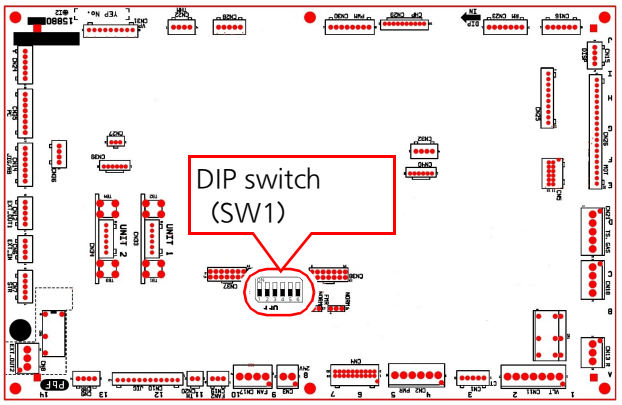
Prior to working on internal parts, such as switching work, turn off power at the power distribution box and ensure safety. After the switching work, put the panels back in place.

♦ Do not touch any live parts. Otherwise, it may result in electric shock or death or serious injury.

- Only qualified personnel who understand electrical knowledge should perform work on internal arts.
- Refer to "9.3.5 How to remove top panel" on page 130, to remove the top panel.
- First of all, turn off all input power including power at the welding power source, the power distribution box (customer supply) and associated equipment, such as jig, and leave it for five minutes to discharge the capacitors.

Attention

Prior to touching a P.C. Board, discharge static electricity through metallic part, such as case. Otherwise, electric parts may be damaged.



5.5.1 DIP switch (SW1)

This DIP switch is to expand the functions of the product.
Change the default settings of the switch only when an optional function is added or functions need to be expanded.

6. Connection

⚠ WARNING

Prior to connection work, make sure to turn off power switch to the power distribution box and confirm safety at the working area. After the connection work, put all panels back in place.
Do not touch any live parts. Otherwise, it may result in electric shock or death or serious injury.

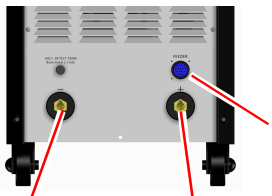
⚠ WARNING

To avoid injury or death during connection work, wear protective clothing designed for welding, such as safety gloves, safety shoes and long-sleeve shirts.

- Only qualified personnel who understand electrical knowledge should perform connection work. If there is no such qualified personnel, please contact Panasonic representatives.
- Only trained and/or qualified personnel who understand electrical knowledge should perform grounding work.
- To ensure operators' safety, connect output cables before connecting input cables.
- Use a specified sized cable or larger one.
- Firmly connect cables.

6.1 Semi-automatic welding

6.1.1 Connecting output cables



Note

About cable-laying

- Lay the base metal cable and torch cable as shown in the figure on the right (as straight as possible).

- Do not coil the cables (base metal cable and torch cable) as per the figure on the right. Or it will result in unstable arc due to its cable impedance

Note

Size of base metal cable and output power cable (Reference)

For power cable, select a cable with the situation of welding operation and rating of the welding power source in mind, that is, if manual welding is used, select a cable that operator does not feel overloaded, and if an automatic welding is used, select a cable that withstands continuous welding operation.

Cable cross section	Allowable current/ Duty cycle (10-minute cycle)		
60 mm^2	400 A/50 %	350 A/65 %	300 A/89 %
80 mm^2	400 A/95 %	389 A or less/100 %	

Note

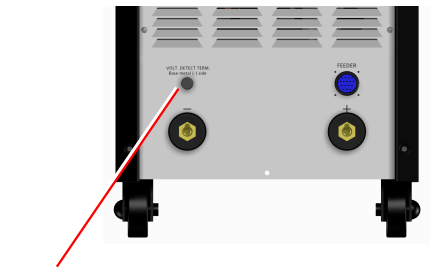
About coupling device

(1) Match the positioning marks (projection) and insert it, and then turn clockwise to lock. Use the coupling device suitable to the size of the applied output cable. Otherwise, it may cause a cable or output terminal to burn.

(Reference) Cable size to DINSE terminal

Cable (Cross section)	DINSE terminal (Model)
60 mm^2	SK70 or SKK70
80 mm^2	SKK95

6.1.2 Connecting base metal (-) voltage detection wire



Base metal (-) voltage detection wire

If arc becomes unstable or spatter increases drastically despite correct use of connection cables (see section "4.2 Peripheral and optional equipment (sold separately)" on page 17), connect the base metal voltage detection wire (sold separately) between the base metal and the base metal voltage detection terminal of the welding power source.

Note

- Base metal voltage detection wire: Model: DWU35317 (3 m)
- Once the base metal (-) voltage detection wire is connected, set the "VOLT. DETECT" settings (Detail mode: Group 3: Submenu 20) to "1" (See page 105.)

6.1.3 Connecting grounding wire and input cables

⚠ WARNING

Observe the following instructions to prevent electric shock.

- Turn off all power including power at the power distribution box and confirm safety before conducting connection work.
- Firmly connect cables.
- Do not connect the grounding wire to water pipe, steel-flame and so on for grounding as they are insufficient for grounding.
- Never connect the grounding wire to the gas pipe.

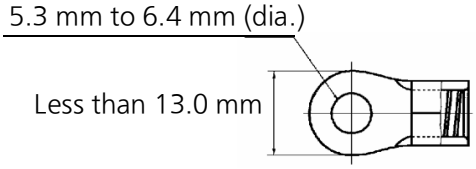
Attention

Only trained and/or qualified personnel who understand electrical knowledge should perform grounding work.

Note

The following cable and wire are customer supply items. Please prepare them accordingly.

- Grounding wire:
  Wire cross section is 5.5 mm^2 or more
- Input cable:
  Wire cross section is 5.5 mm^2 or more
- Recommended crimp terminal



* To avoid electric shock and short circuit of input cable, make sure to insulate the crimping part and bare conductor parts of the crimp terminal with protective cap or insulating tape.

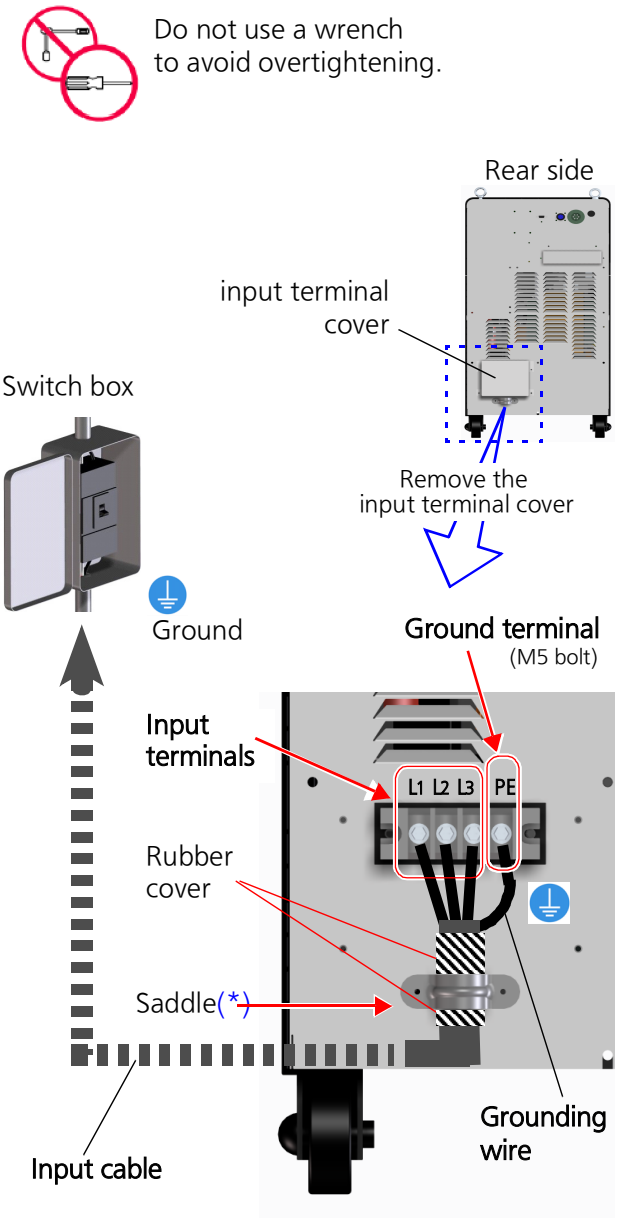
1) Connecting grounding wire

(1) Remove the input terminal cover from the rear side panel.

(2) Connect the grounding wire to the terminal PE (ground terminal) at the far right of the terminal block.
* Tightening torque: 1.7 N·m to 2.3 N·m

< Note >
Draw the grounding wire loosely.

(3) Provide 100-ohm or less grounding work of the appropriate level to the other end of the grounding wire, either to the switch box or to the ground. (See the figure on the right.)



2) Connecting input cable

Provide one switch box for one welding power source and connect according to the figure.

(1) Turn off the power at the power distribution box (customer supply).

(2) Remove the input terminal cover.

(3) Connect one end of the input cable (L_1 (U), L_2(V), L_3(W)) through the saddle to the input terminal.
* Tightening torque: 1.7 N·m to 2.3 N·m

< Note >
- No particular phase order to connect.
- Do not use a wrench to avoid overtightening of the crimp terminal.

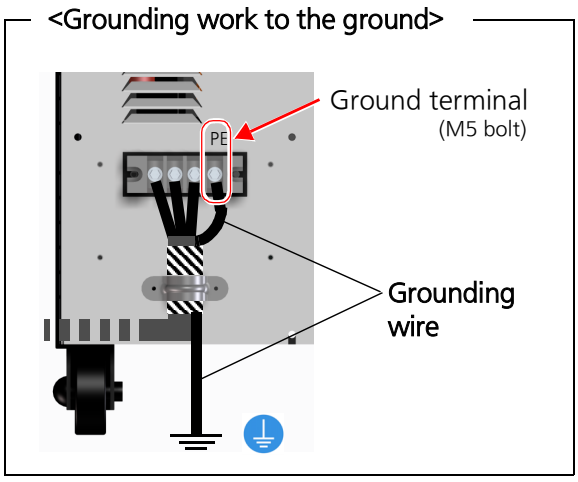
(4) Wrap the input cable with the grounding wire with the supplied rubber cover and then set the saddle over the rubber cover to fix the cable.

< Note >
Cut the rubber cover to fit the input cable if necessary.

(5) Place the input terminal cover back in place.

< Note >
To ensure safety, fix the input terminal cover with a screw.

(6) Connect the other end of the input cable to the load terminal of the switch box.

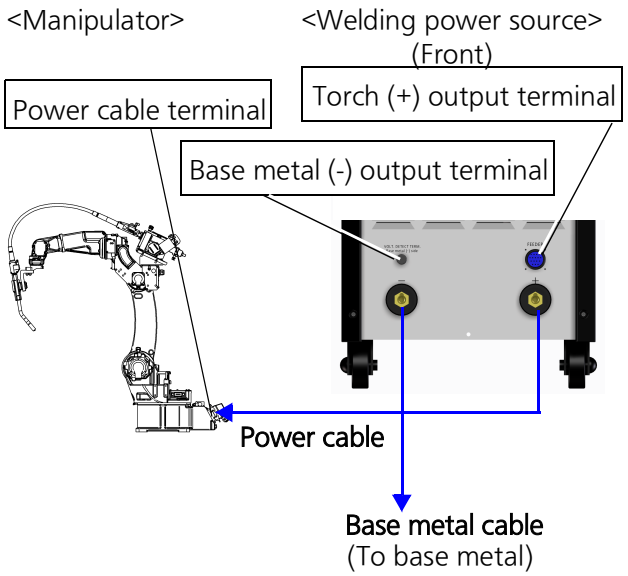


6.2 Robotic welding

6.2.1 Applicable robot models

Model	Applicable software version
GIII series	24.00 (Manufactured in June, 2016 onwards.)

6.2.2 Connecting output cables



(1) Connect the coupling devices
Match the positioning marks (projection) and insert it, and then turn clockwise to lock.
Use the coupling device suitable to the size of the applied output cable. Otherwise, it may cause a cable or output terminal to burn.

(Reference) Cable size to DINSE terminal

Cable (Cross section)	DINSE terminal (Model)
60 mm^2	SK70 or SKK70
80 mm^2	SKK95

(2) Connect base metal cable
Connect the base metal bolt to the base metal (-) output terminal.

(3) Connect power cable
Connect the torch cable drawn from the wire feeder to the torch (+) output terminal.

Note

- Lay the base metal cable and torch cable as per the figure on the right (as straight as possible).

Do not coil the cables (base metal cable and torch cable) as per the figure on the right. Or it will result in unstable arc due to its cable impedance.

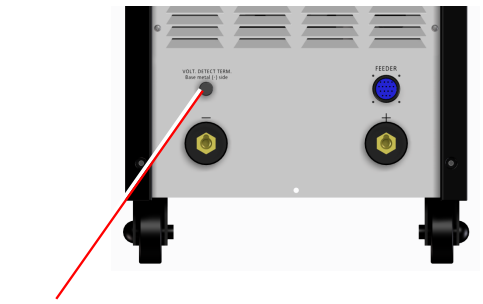
*Tightening torque:10.10 N·m-13.40 N·m

Note

- Size of output power cable (Reference)
Select a cable with the situation of welding operation and rating of the welding power source in mind, that is, in case of manual welding, select a cable that operator does not feel overloaded, and in case of automatic welding, select a cable that withstands continuous welding operation.

Cable cross section	Allowable current/ Duty cycle (10-minute cycle)		
60 mm^2	400 A/50 %	350 A/65 %	300 A/89 %
80 mm^2	400 A/95 %	389 A or less/100 %	

6.2.3 Connecting base metal voltage detection wire



Base metal (-) voltage detection terminal

If arc becomes unstable or spatter increases drastically despite correct use of connection cables (see section" 4.2 Peripheral and optional equipment (sold separately)" on page 17), connect the base metal voltage detection wire (sold separately) between the base metal and the base metal voltage detection terminal of the welding power source.

Note

- Base metal voltage detection wire:
  Model: DWU35317 (3 m)
- Once the base metal (-) voltage detection wire is connected, set the "VOLT. DETECT" settings (Detail mode: Group 3: Submenu 20) to "1" (See page 105.)

6.2.4 Connecting grounding wire and input cable

⚠ WARNING

Observe the following instructions to prevent electric shock.

- Turn off all power including power at the power distribution box and confirm safety before conducting connection work.
- Firmly connect cables.
- Do not connect the grounding wire to water pipe, steel-flame and so on for grounding as they are insufficient for grounding.
- Never connect the grounding wire to the gas pipe.

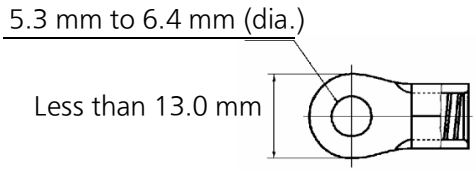
Attention

Only trained and/or qualified personnel who understand electrical knowledge should perform grounding work.

Note

The following cable and wire are customer supply items. Please prepare them accordingly.

- Grounding wire:
  Wire cross section is 5.5 mm^2 or more
- Input cable:
  Wire cross section is 5.5 mm^2 or more
- Recommended crimp terminal



* To avoid electric shock and short circuit of input cable, make sure to insulate the crimping part and bare conductor parts of the crimp terminal with protective cap or insulating tape.

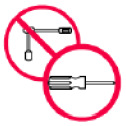
1) Connecting grounding wire

(1) Remove the input terminal cover from the rear side panel.

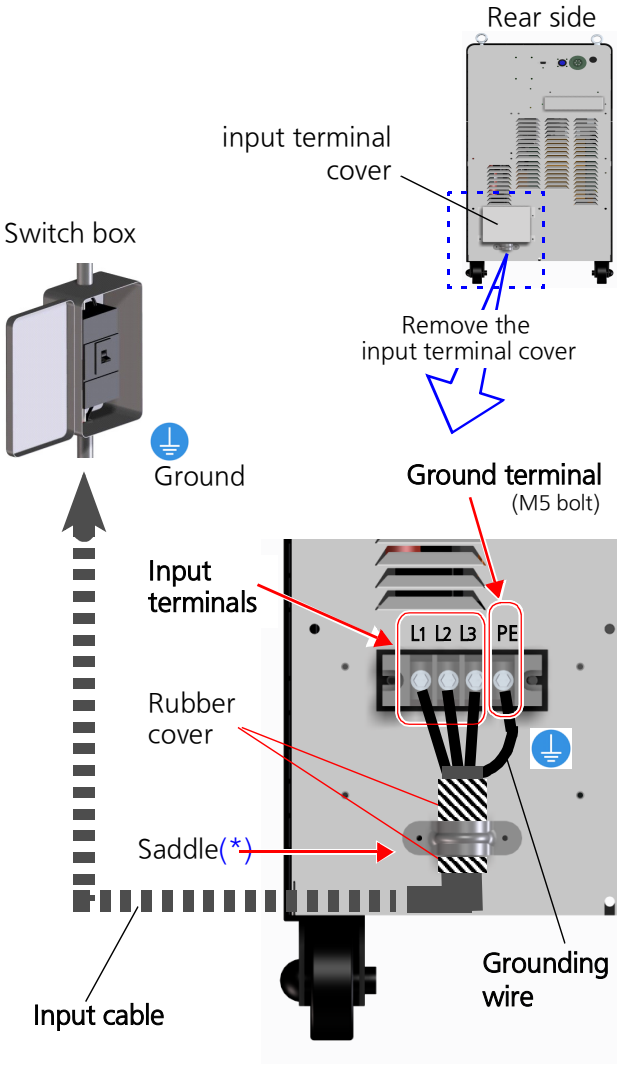
(2) Connect the grounding wire to the terminal PE (ground terminal) at the far right of the terminal block.
* Tightening torque: 1.7 N·m to 2.3 N·m

< Note >
Draw the grounding wire loosely.

(3) Provide 100-ohm or less grounding work of the appropriate level to the other end of the grounding wire, either to the switch box or to the ground. (See the figure on the right.)



Do not use a wrench to avoid overtightening.



2) Connecting input cable

Provide one switch box for one welding power source and connect according to the figure.

(1) Turn off the power at the power distribution box (customer supply).

(2) Remove the input terminal cover.

(3) Connect one end of the input cable (L_1 (U), L_2(V), L_3(W)) through the saddle to the input terminal.
* Tightening torque: 1.7 N·m to 2.3 N·m

< Note >
- No particular phase order to connect.
- Do not use a wrench to avoid overtightening of the crimp terminal.

(4) Wrap the input cable with the grounding wire with the supplied rubber cover and then set the saddle over the rubber cover to fix the cable.

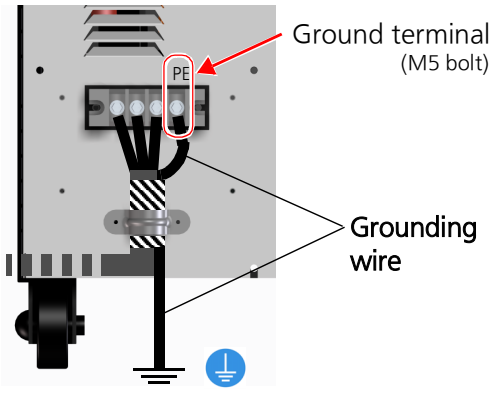
< Note >
Cut the rubber cover to fit the input cable if necessary.

(5) Place the input terminal cover back in place.

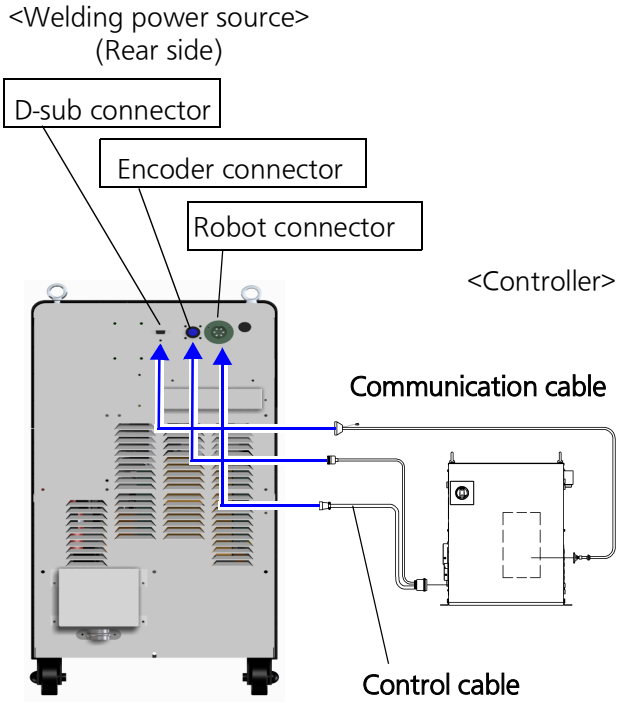
< Note >
To ensure safety, fix the input terminal cover with a screw.

(6) Connect the other end of the input cable to the load terminal of the switch box.

<Grounding work to the ground>



6.2.5 Connecting cables for robot controller



(1) Connect control cable
Connect the control cable between the encoder connector and the robot connector.

(2) Connect communication cable
Connect the communication cable to the D-sub connector.

6.2.6 Communication error

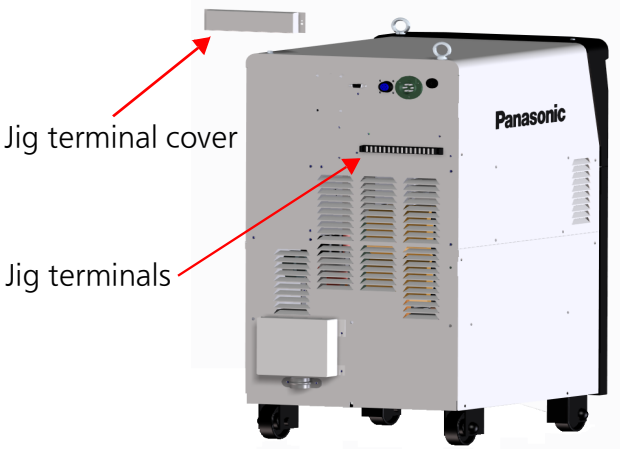
In case that an error occurs while communicating with the robot, the error codes (main and sub) are indicated on the operation panel of the welding power source. See section “10.1 Error No. indication” on page 132.

6.3 Connecting to other devices

Use the jig terminal to apply an emergency stop or a halt to the power source from an external device, or to apply the current detection signal to an external device and so on. The product provides terminals for external voltmeter and ammeter.

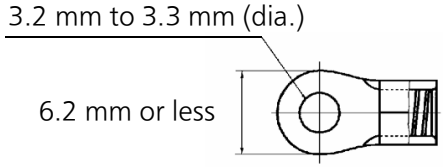
⚠ WARNING

Prior to connection work, make sure to turn off power switch to the power distribution box and confirm safety at the working area. After the connection work, put all panels back in place.
Do not touch any live parts. Otherwise, it may result in electric shock or death or serious injury.



Precautions for handling jig terminals

- Do not tighten the jig terminal screws too tight, otherwise, the terminal block may be damaged.
  Tightening torque: 0.45 N·m-0.55 N·m
  <Recommended crimp terminal>

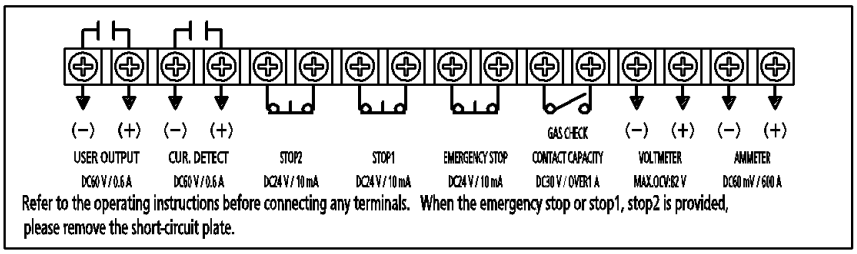


- Lay signal cables from other devices away from welding torch cable, output cable and so on to avoid any trouble caused by noise.
- Cable should be 10 m or shorter.

6.3.1 Jig terminals

Note

- Remove the shorting bar before using the terminals if inserted. Otherwise, the terminals won't function.
- Connect the start signal of the welding power source to the torch switch outlet of the wire feeder.
- Voltmeter and ammeter terminals are directly connected to the output circuit of the welding power source. Connect instruments with caution, such as electrical insulation from circuit of other devices, grounding fault, short-circuit protection and noise contamination prevention in mind.

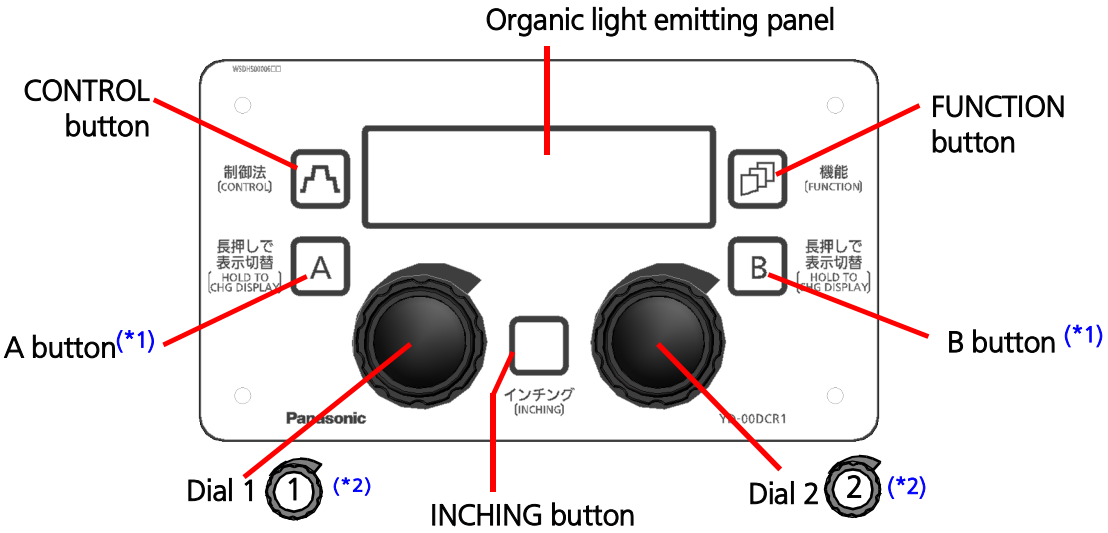


Terminal name		Functions	Remarks
INPUT	STOP1 STOP2	Open the terminals to bring the welding power source to a temporary stop. At that time, gas check, wire inching and wire retract functions as well as welding output, gas supply and wire feed functions stop. • **STOP 1:**Connect a signal, such as gas pressure drop detection signal. • **STOP 2:**Connect a signal, such as low water detect signal when water cooled torch is used. **<How to reset>** Close the terminals	• Voltage when terminal is open: 24 V DC • Current when terminal is closed: 10 mA DC • Use a signal free from contact failure to connect to each terminal.
	EMERGENCY STOP	Open the terminals to bring the welding power source to an emergency stop. At that time, welding output, gas supply and wire feed functions are stopped. **<How to reset>** Turn the power switch OFF and close the terminals, and then turn the power switch back ON again.	
OUTPUT	USER OUTPUT	Use it when the contact output of the management function is set to Valid. See section "8.5 Group2: MANAGEMENT related settings" on page 95.	Rated output (at resistance load) Load voltage: 60 V DC Load current: 0.6 A DC • Do not exceed the above ratings. • Do not use alternate current (AC)
	CUR. DETECT	It closes while flowing welding current. Use it to synchronize the welding current state with an external device.	
GAS CHECK		Close the terminals with a non-voltage contact, such as push button, to activate the gas supply solenoid valve of the wire feeder.	Required capacity of the contact: 30 V DC /1 A or larger
VOLTMETER		It is to connect a DC voltmeter to display output voltage.	Voltmeter type: displays 100 VDC or larger values.
AMMETER		It is to connect a DC ammeter to display output current.	Ammeter type: an exterior type DC ammeter connectable to a shunt (60 mV DC/600 A DC). *This product has a built-in shunt. For the size of the cable to connect to the ammeter, use one specified by the manufacturer of the instrument.

6.3.2 Digital remote controller

This section explains functions and usage unique to YD-400VP1YHD. For standard usage and connection, please refer to the operating instructions of the digital remote controller.

1) Operation sheet

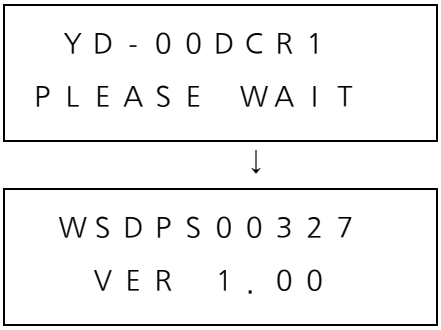


(*1): "HOLD" means long press the button for 2 seconds or longer, otherwise press the button less than 2 seconds.

(*2): To change a value with a Dial, turn clockwise to increase and turn counter-clockwise to reduce.

2) Panel display at start

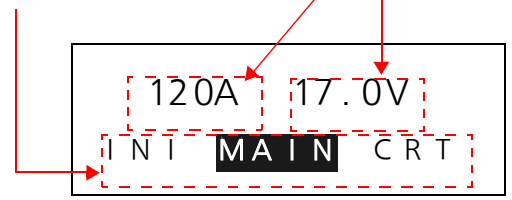
[Initial check]
Check and confirm that the settings of DETAIL mode: Group 3: Submenu 03 "ANALOG RC" is set to "0: Without".
For details of the setting procedure, see "8.6 Group3: SYSTEM settings" on page 104.



(Displays the software version of the remote controller)

《Normal》
It displays welding conditions stored in the welding power source.

- Welding current set value
- Welding voltage set value
- Welding control process



(Display contents vary with stored data.)

<Error>

(An example)

Probable causes:
- Defective communication circuit.
- Not applicable welding power source.

3) What this remote controller can do

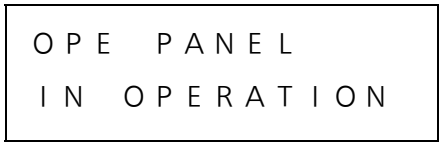
- Switching control processs
  - NO CRATER .....MAIN
  - CRATER .....MAIN and CRATER
  - INI.&CRATER .....INITIAL, MAIN and CRATER
  - ARC SPOT.....ARC SPOT
- Setting welding voltage at arc spot
  - UNITARY .....Arc spot voltage, Voltage fine adjustment value, Arc spot time
  - INDIVIDUAL.....Arc spot voltage, Arc spot time
- Setting welding current, wire feed rate and thickness
- INCHING operation
- Pulse setting
- Various functions
  1. CH CALL.....Call CH data to play, display comment
  2. CH RECORD .....Save/delete CH data
  3. SETTING.....Adjusting waveform control and wire feed rate
  4. UNITARY/INDIVIDUAL .....Voltage at Unitary/individual setting
  5. GAS-CHECK.....Perform/terminate gas check function
  6. Pulse setting.....Whether to use pulse
  7. WELD CONDITION .....Display weld conditions displayed on the panel of the welding power source

4) Error display

Displays the error number and content in case of an error.

5) Other messages

While “LOCK” is applied on the welding power source, the remote controller cannot be used.

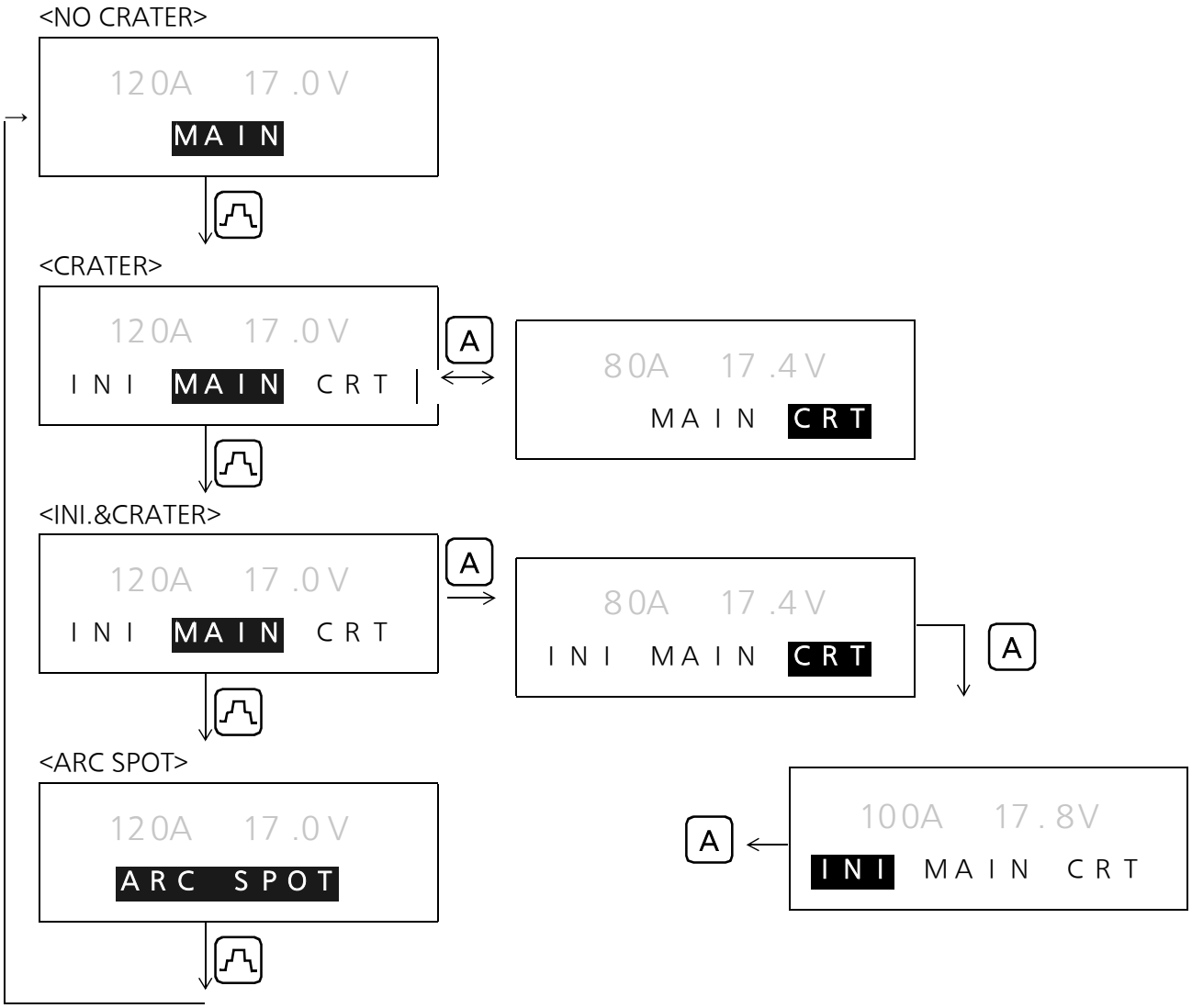


While performing “Select or “Set”functions on the welding power source, the remote controller cannot be used. It is to avoid possible discrepancy in panel display between the remote controller and the welding power source.

The messages may be displayed when welding conditions were changed using the panel on the welding power source.

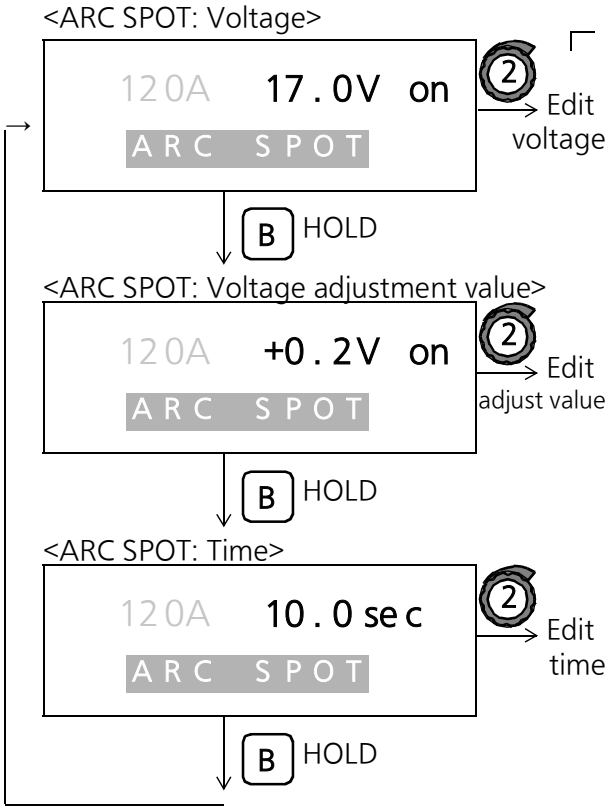
6) Switching welding processes

* Target display letters for the specified operation are indicated in boldface.

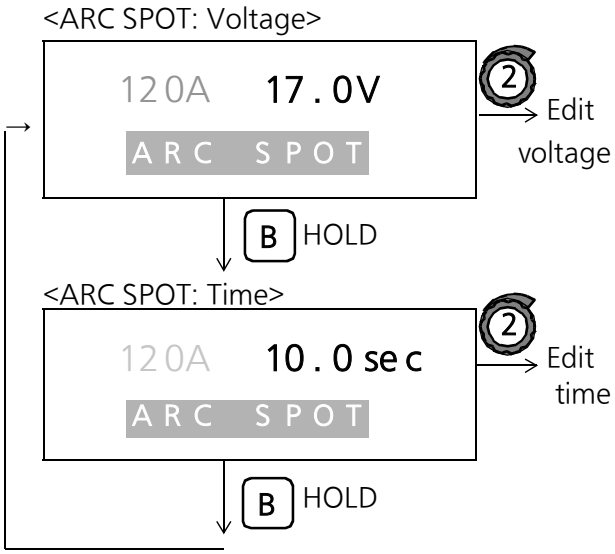


▶Setting welding voltage at arc spot

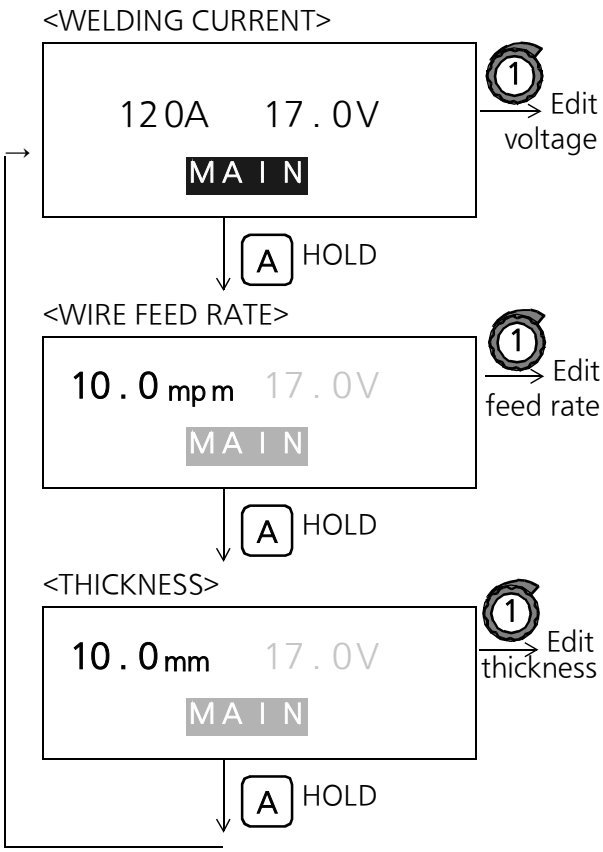
(1) UNITARY: Voltage



(2) INDIVIDUAL: Voltage

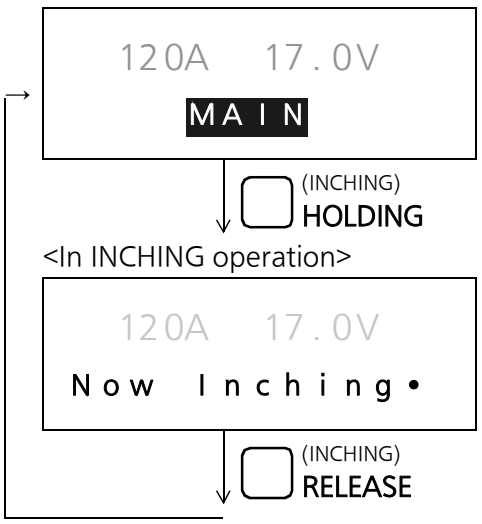


▶Switching Welding current, Wire feed rate and Thickness



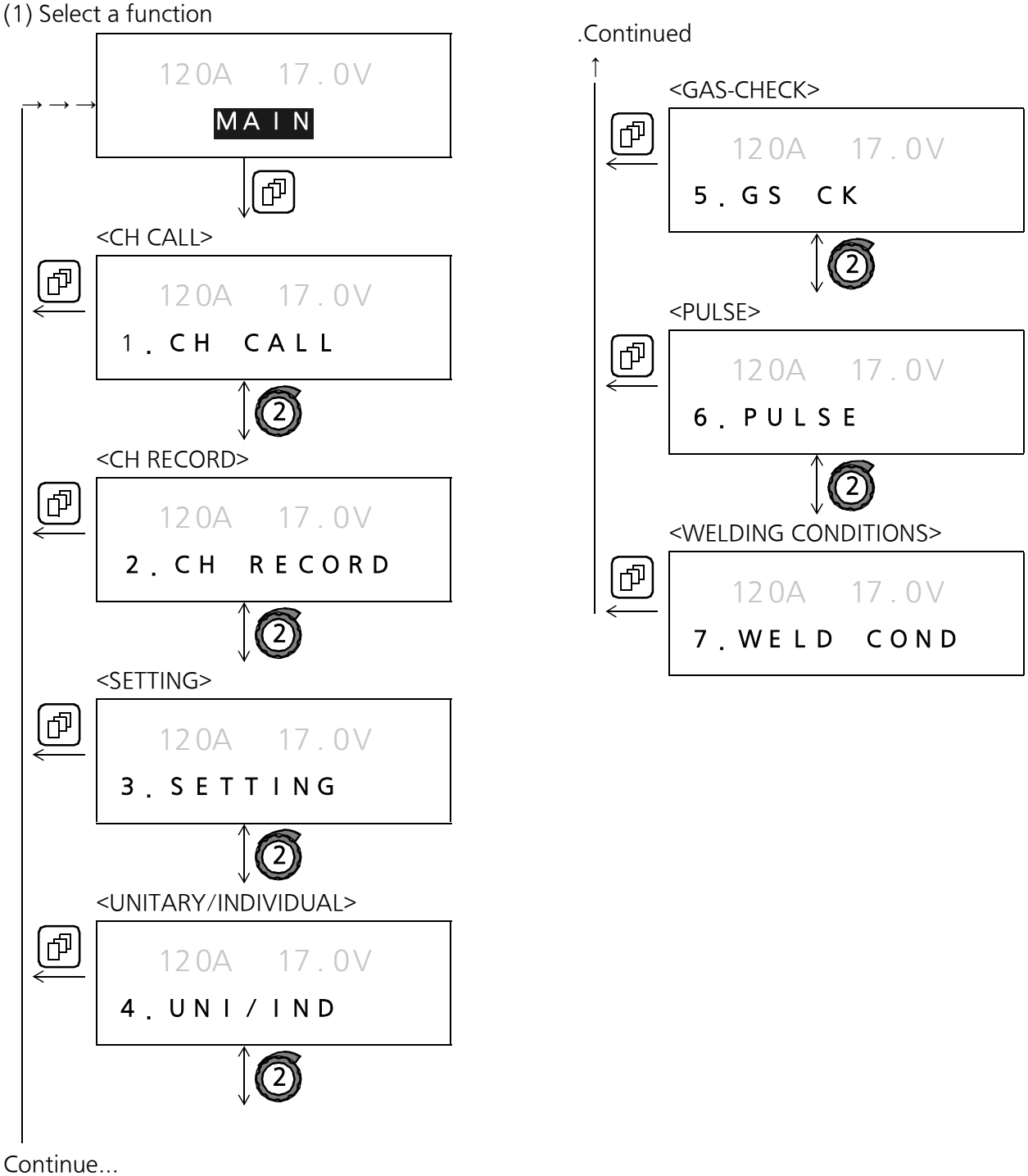
* mpm:Meter per Minute

▶INCHING operation



▶Functions

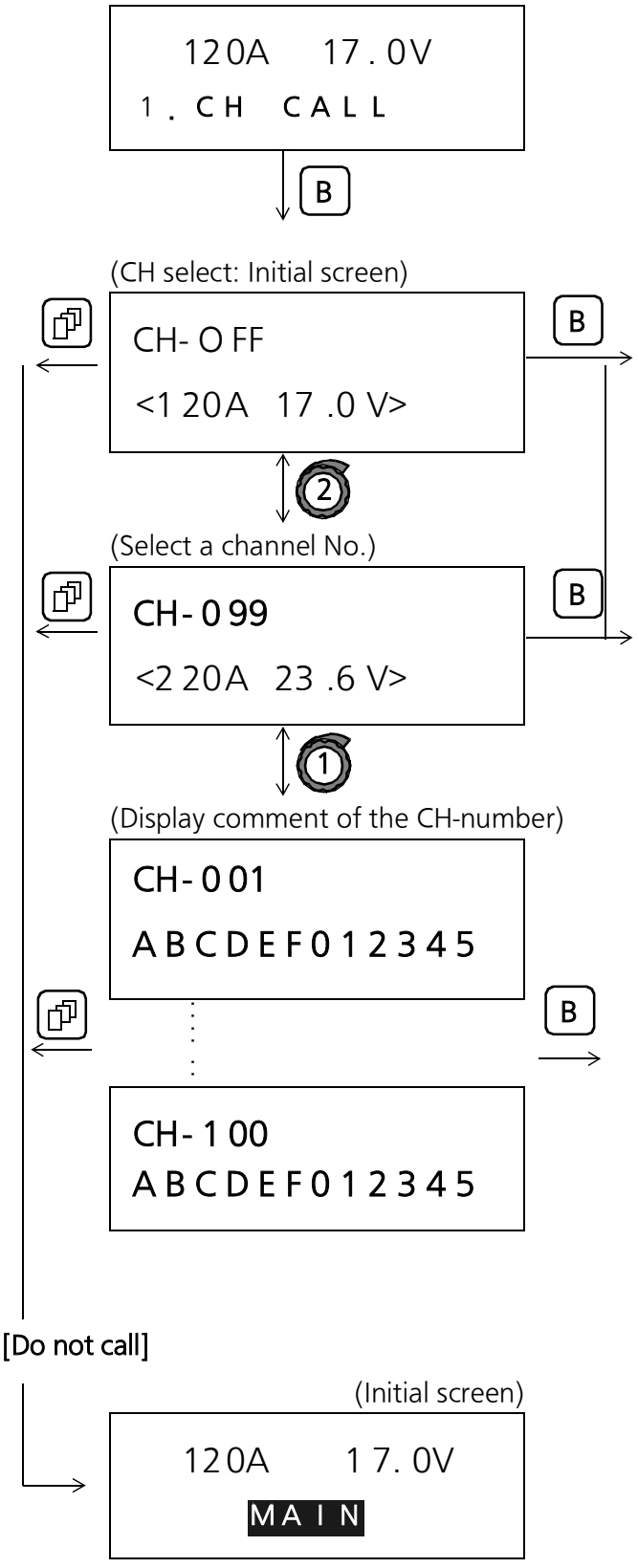
(1) Select a function



(2) Functional operation

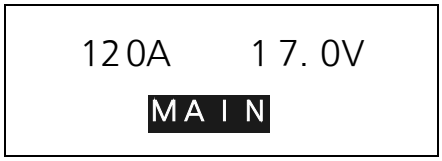
1. CH CALL

Call data of the specified CH No. to play



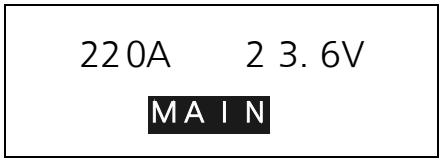
* In case of "CH-OFF": Do not CALL.

(Initial screen)



【Call CH-0**】

* In case of "CH-099": Call CH-09

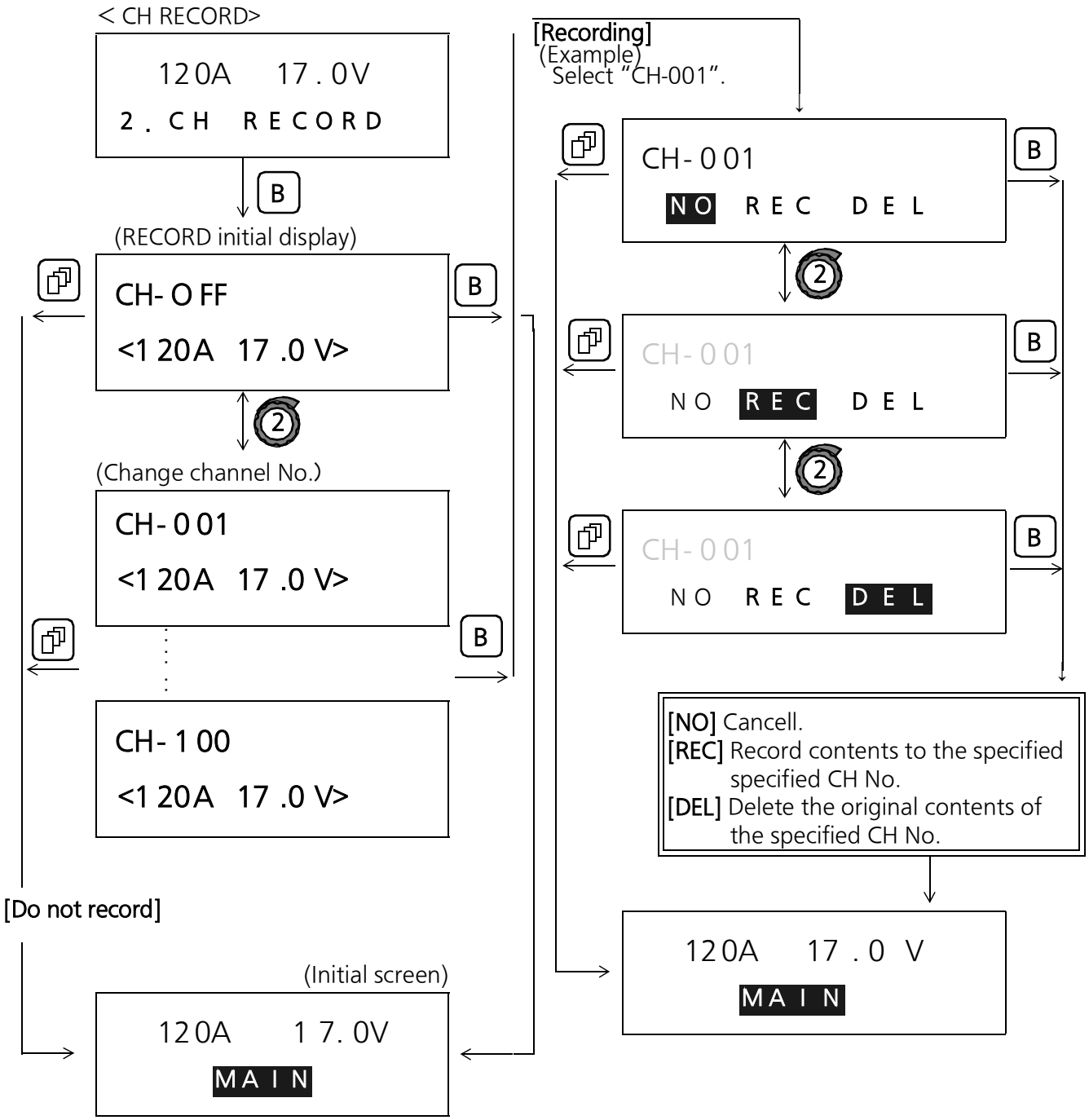


About displayed comment

- Up to 12 letters of comment are indicated.
- Turn the dial 1 clockwise to display the remaining comment if ">" appears at the upper right edge of the display.
- "<" appears after displaying the last letter of the comment.
- If letters lie before and/or after the displayed comment, "<" and/or ">" appear.

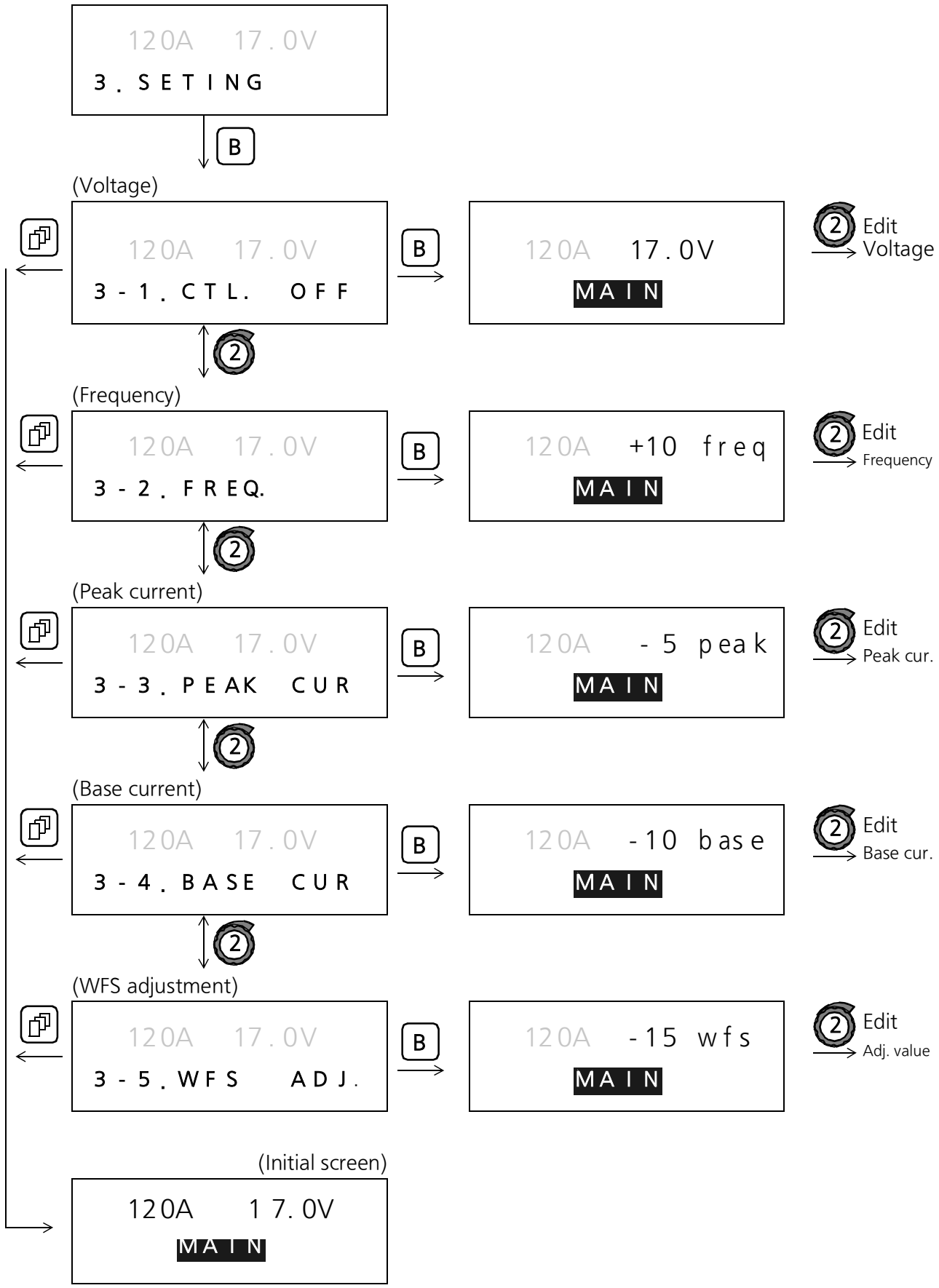
2. CH RECORD

Save or delete data of the specified CH number



3. Settings

Adjust waveform control and wire feed rate

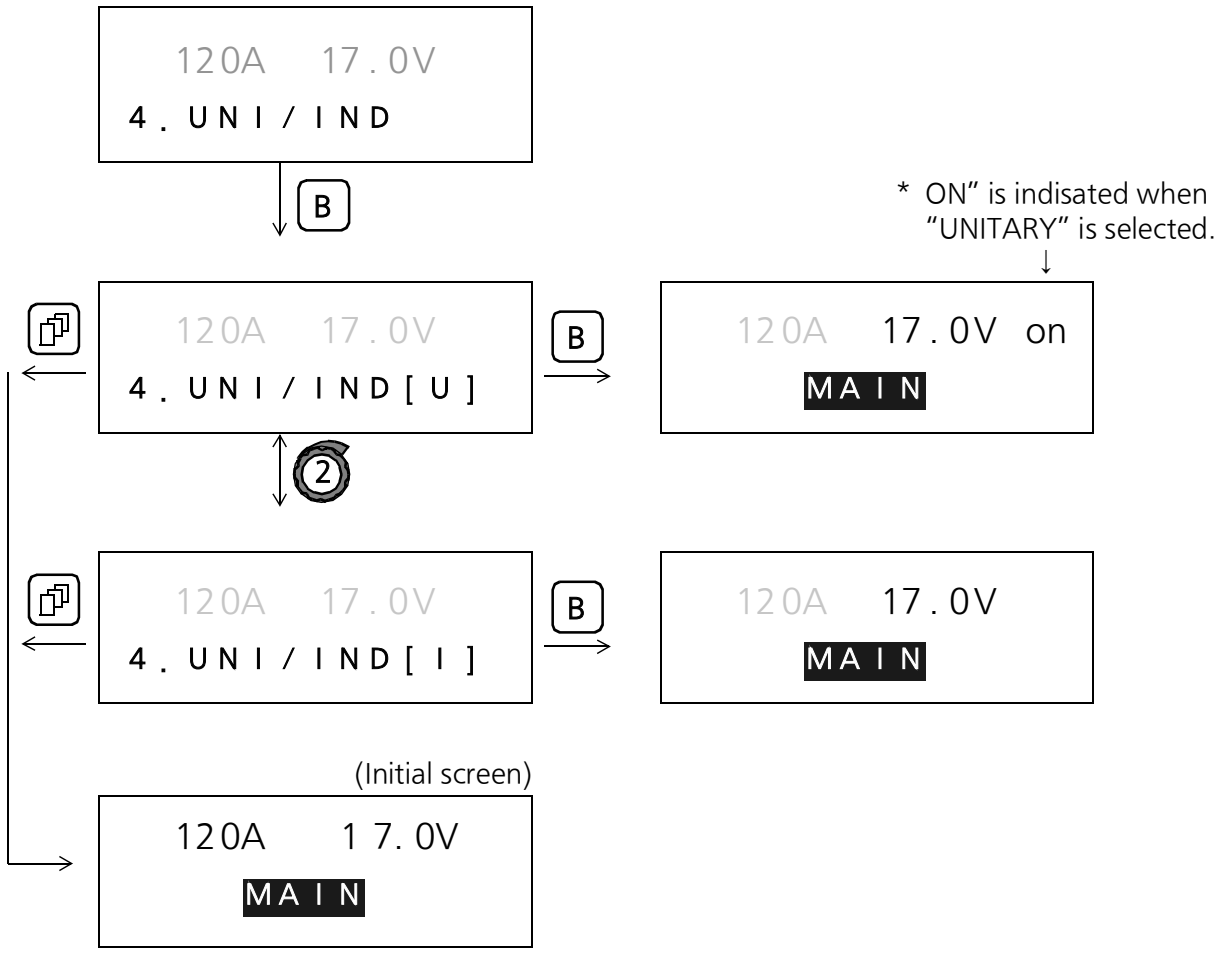


Note

- If “3-2. FREQ.”, “3-3. PEAK CUR”, “3-4 BASE CUR” or “3-5. WFS ADJ.”, “CH CALL” and “CH RECORD” functions are not applicable during operation.
- After displaying an edit screen by pressing B button, if you would like to edit a different item, for example from wave control to voltage, press and select “3. Setting”, and then re-do the above procedure.

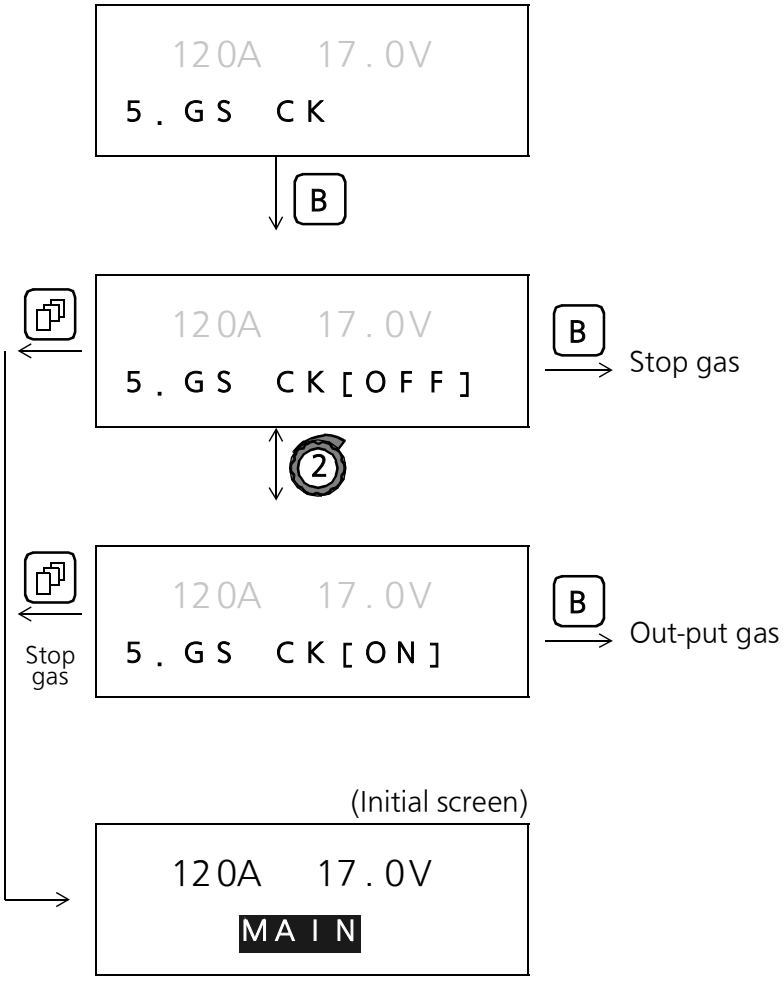
4. UNITARY/INDIVIDUAL

Set voltage at unitary/individual setting



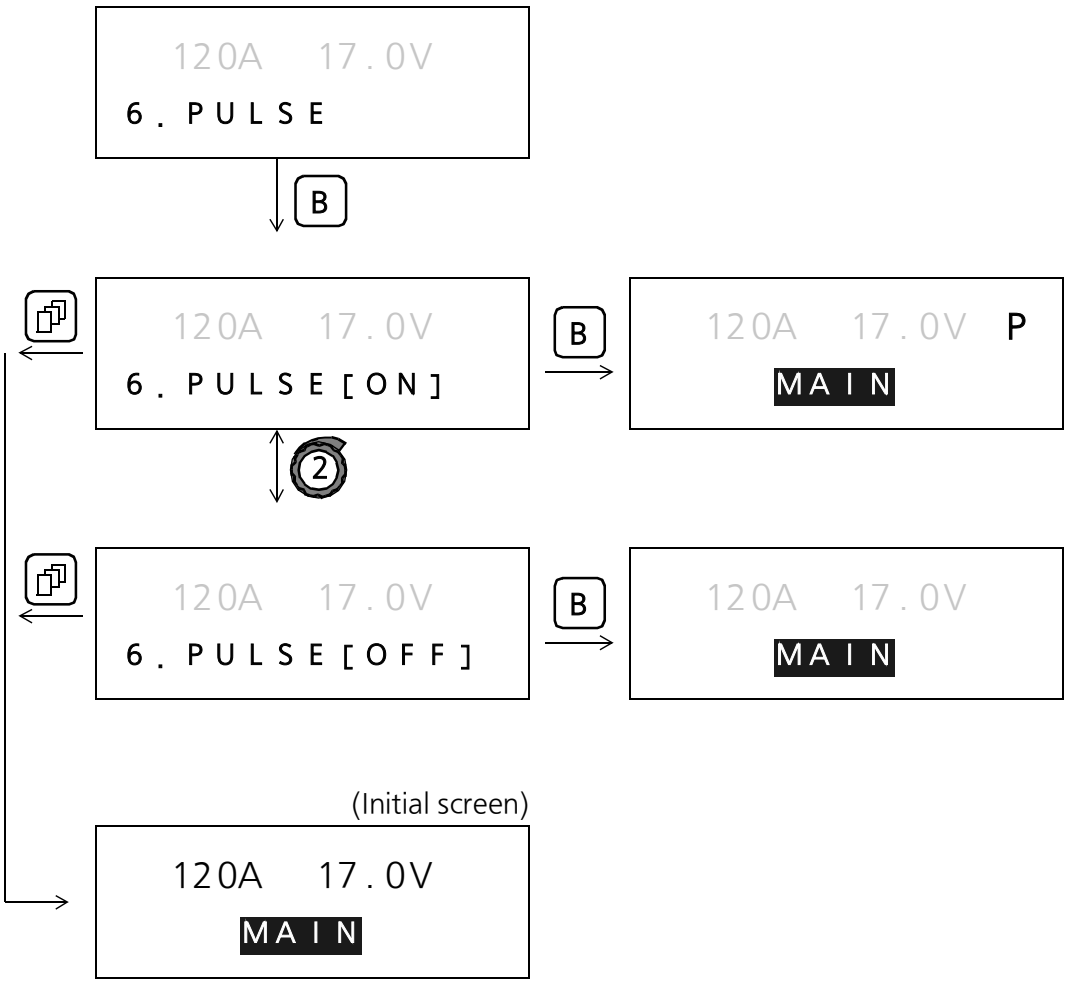
5. GAS CHECK

Perform gas check operation.



6. PULSE

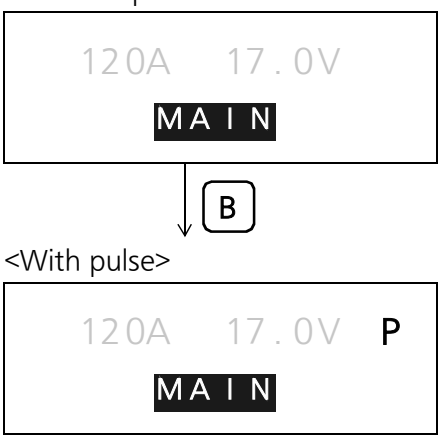
- Set whether to use pulse or not



- Use button for settings

With "Individual Voltage" settings

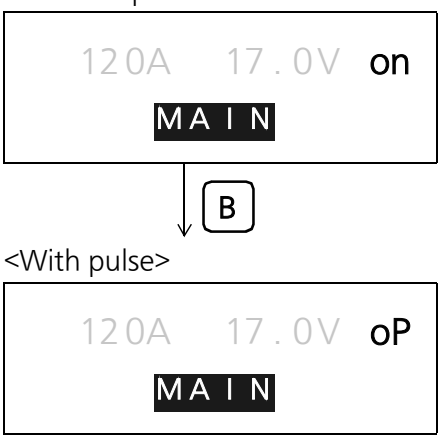
<Without pulse>



<With pulse>

With "Unitary Voltage" settings

<Without pulse>



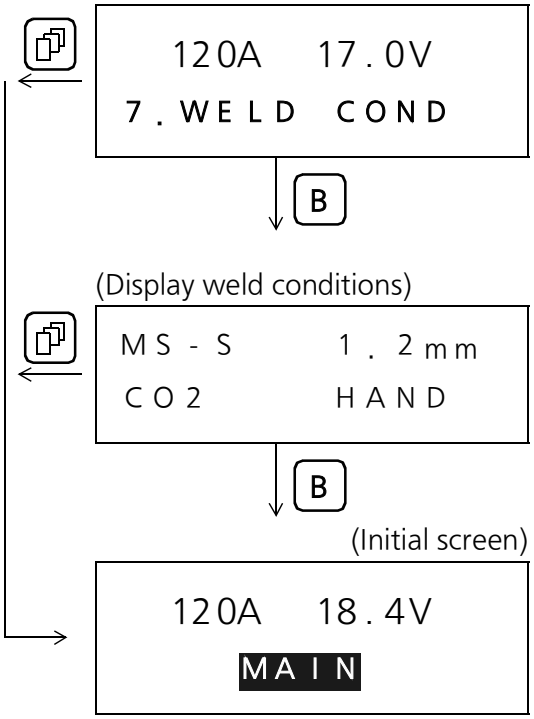
<With pulse>

Note

- If the selected welding condition (material/wire/gas) is not pulse applicable type, the button is disabled. Therefore, specify the welding condition first.

7. WELDING CONDITIONS

Display weld conditions displayed on the panel of the welding power source.



7. Welding operation

7.1 Operation procedure

⚠ WARNING

Provide sufficient ventilation or wear breathing equipment. Toxic fumes and gases generated during welding can be hazardous.

- Welding in a confined area can cause suffocation due to oxygen deficiency.
- Inhalation of gases and fumes generated during welding can damage health.

⚠ WARNING

Prior to welding operation, ensure workplace safety to prevent fire, explosion and blow-out.

- Remove any combustible materials in and around the work site to prevent exposure to such combustible materials to spattering. If they cannot be relocated, cover them with a fireproof cover.
- Do not conduct welding near combustible gases.
  Do not place the welding power source near combustible combustible gases, otherwise, such gases may catch fire from a spark of electricity inside the welding power source as it is electric equipment.
- Do not bring hot base metal, such as a piece immediately after welding, near combustible materials. When welding a ceiling, floor or wall, remove all combustible materials, i including one located in hidden places.

⚠ WARNING

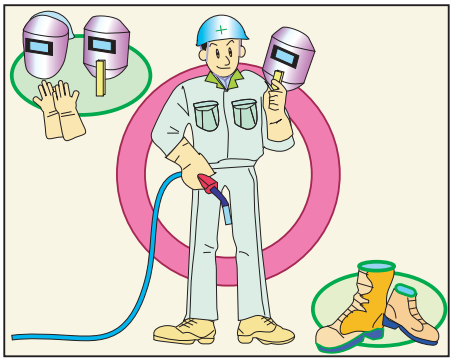
Prior to welding operation, ensure workplace safety to prevent fire, explosion and blow-out.

- Firmly connect cables and insulate the connected parts.
- Connect the base metal cable as close as possible to the welding section.
- Do not weld a sealed tank or a pipe that contains gas.
- Keep a fire extinguisher near the welding site in case of an emergency.

⚠ CAUTION

Wear protective gears to protect you and other personnel against arc flash, flying spatter and slugs and noise generated during welding.

- Wear protective gears, such as leather gloves and protective shoes, to prevent exposure of eyes and skin of people in the surrounding area to the arc flash.
- Wear protective glasses with sufficient light blocking structure or use a protective mask designed for applied welding current.
- Prepare noise-proof protective equipment.



7.1.1 Operation flow

1) Prior to operation

(1) Wear protective gears

Refer to the above-described “Warning” and “Caution” and wear necessary protective gears.

(2) Check connections

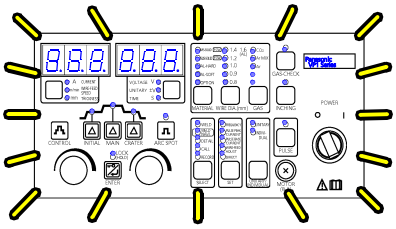
Check and confirm all connections of input power, ground wire, base metal, wire feeder, other associated equipment and gas.

(3) Power ON

- Turn on power at the power distribution box.
- Turn on power at the welding power source.

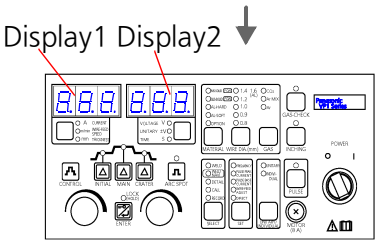
① All LEDs and LCDs on the operation panel is lit for about 0.5 second.

Then they are turned off sequentially.

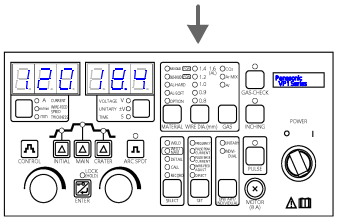


② Display1) and version number (on Display2) of the following items are indicated on the Displays1&2.

- Main board CPU1
- Main board CPU2
- Operation board



③ Then, the welding power source goes into the standby state.



(4) Specify Material/Wire dia./ Gas, Pulse

* Specify them on the operation panel. (For details, see section “7.1.2 Specifying welding conditions (material/wire diameter/gas and pulse)” on page 63.)

(5) Specify control process

* Specify them on the operation panel. (For details, see section “7.1.3 Specifying CONTROL process” on page 66.

(6) Pre-operation check

Check GAS CHECK function, wire extension length, INCHING function and shield gas. (Details are described below.)

1) Check “GAS CHECK” function (Operable only in the standby state)

- Press the GAS CHECK button on the operation panel to start.
- LED lights.
- LCD on the operation panel shows the countdown of seconds until the gas check automatically ends (in 60 seconds).

- To force-quit the gas check operation, press the GAS CHECK button once again. (At that time, LED and gas go out).
- If welding operation is started while LED is ON, the gas check function performs a force-quit (At that time, gas flows continuously.)

(6. Pre-operation check)

2) How to check "Wire extension length"

<Semi-automatic welding: distance between tip and base metal>

- Welding current output value to the welding current set value is based on the following "Tip-base metal distance".
- Difference in tip-base metal distance between actual value and the value in the following table creates a difference between the actual output current and current set value.
- As it also affects shielding performance, make sure to set the tip-base metal distance according to the following table.

Tip-base metal distance (mm)

Welding current set value	Wire diameter (mm)			
	0.8	0.9	1.0/1.2	1.4/1.6
50 A	10	12	15	—
100 A	10	12	15	—
150 A	10	12	15	—
200 A	14	18	18	18
250 A	—	18	18	18
300 A	—	—	22	22
350 A	—	—	25	25
400 A	—	—	—	27

3) How to check "INCHING" function

Perform inching operation and check if wire feeds properly.
(See section "7.1.4 Checking INCHING function" on page 68.)

4) How to check "Shield gas"

If it is necessary to check the shield gas, such as flow rate, press the GAS CHECK button.

⚠ CAUTION

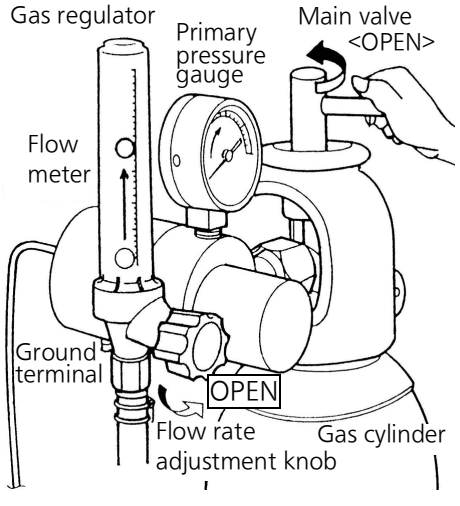
Prior to checking, read the operating instructions of the gas regulator. Wrong handling can cause injury due to high-pressure gas.

(1) Check if flow rate adjustment knob is in the SHUT position.
Then open the main valve of the gas cylinder..

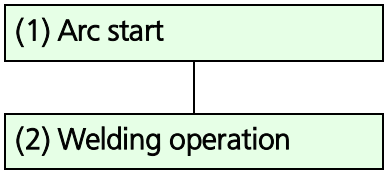
(2) Press the GAS CHECK button on the operation panel.

(3) Gradually turn the flow rate adjustment knob to the "OPEN" position until the flow meter indicates the suitable value.

(4) After completing the flow rate adjustment, press the GAS CHECK button again.



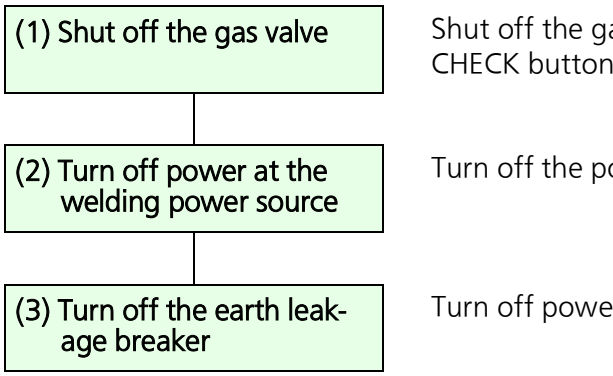
2) Welding operation



3) Terminating welding operation

Attention

After completing welding operation, leave it for three to five minutes to cool down the inside of the welding power source before turning off power at the welding power source.

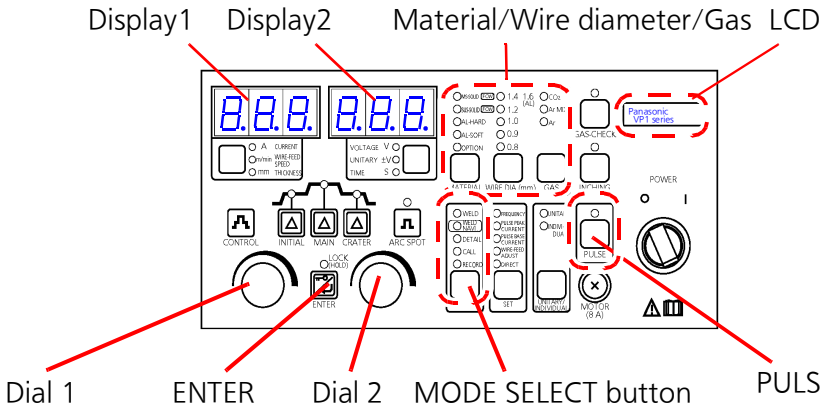


Shut off the gas valve at the gas cylinder, and then press the GAS CHECK button to remove residual pressure from the pipe.

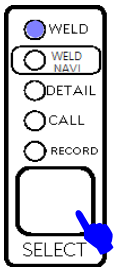
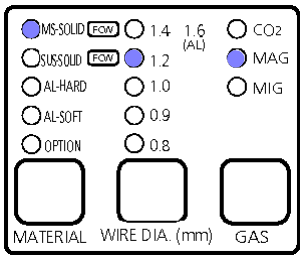
Turn off the power switch of the welding power source.

Turn off power at the power distribution box.

7.1.2 Specifying welding conditions (material/wire diameter/gas and pulse)

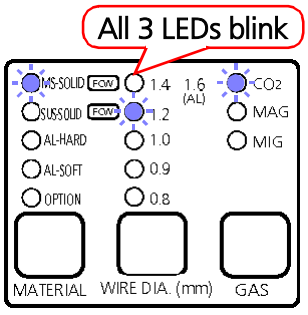


1. Select a mode.

Press mode SELECT button several times until LED for WELD lis lit.		(No indication)
The LEDs of the current welding conditions (material, wire diameter and welding process) or default settings are lit (or blink).	Current welding conditions. 	(No indication)

2. Specify welding conditions (Material, Wire diameter, Gas and Pulse.

Select a material, wire diameter and gas

Press any one of MATERIAL, WIRE DIA., GAS select buttons, then all 3 lighted LEDs turns blinking. → While LEDs are blinking, the welding power source is searching the welding table of the combination. (Example of welding conditions: Mild steel, 1.0 mm (in dia.) and CO_2 gas.)		WELDING DURING DATA RETRIEVAL

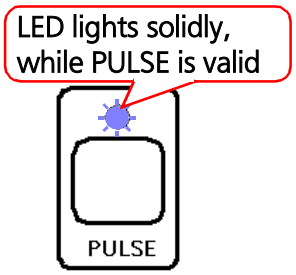
Determine the use of PULSE

Select whether to use PULSE or not.

→ If PULSE is set to valid, the LED above the button lights solidly.

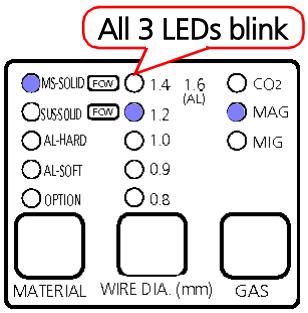
If the selected welding condition is not pulse applicable type, the button is disabled and the LED above the button stays OFF state.

Pressing PULSE button alternately switches valid and invalid of PULSE.



● If a weld table for the selected material, wire diameter and gas exists.

→ The LEDs of the selected items turns solid.



(No indication)

● If a weld table for the selected material, wire diameter and gas does no exist.

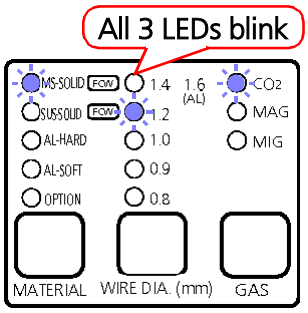
→ All 3 LEDs remains blinking.

→ LCD shows the message “THERE IS NO WELDING DATA”.

→ Displays1&2 on the operation box show “-—— ” and the following operations are disabled.

- Welding output,
- Receiving torch switch (TS)
- Inching, and
- Gas check

Select different welding conditions (material, wire diameter and gas type).



THERE IS NO WELDING DATA

● Changed welding conditions but still cannot find corresponding welding table.

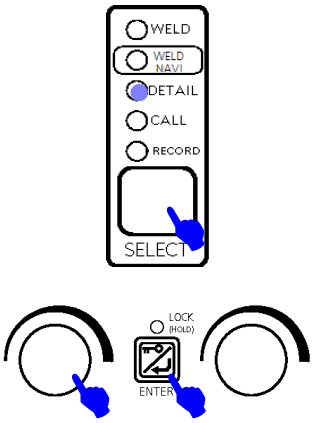
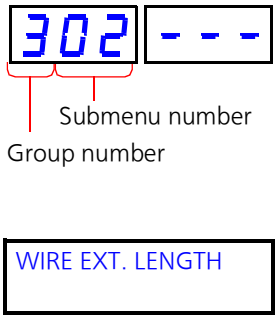
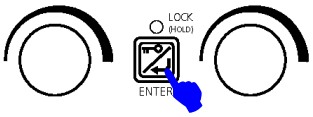
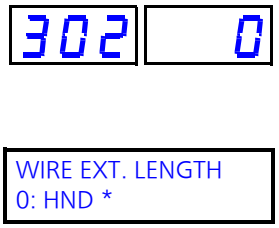
Check if wire extension length is correct.

Display1 Display2

- - - - - -

LCD

THERE IS NO WELDING DATA

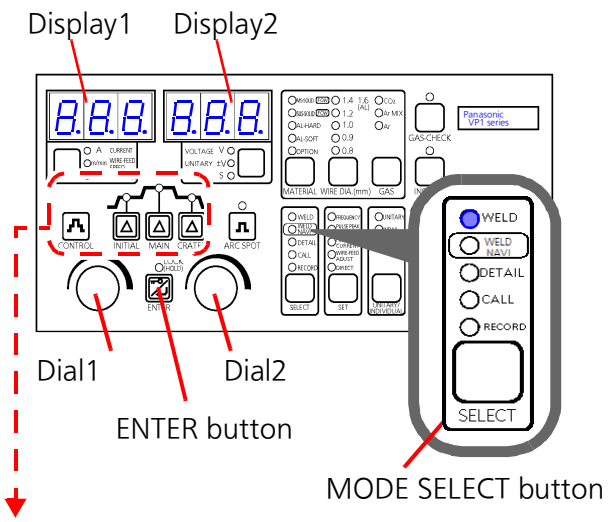
Move to the wire extension length setting (Mode: DETAIL, Group: 3, Submenu: 02).		
Press mode SELECT button to select DETAIL and press ENTER button. Turn Dial 1 to display “3” on the far left column of Display1, and press ENTER button. Turn Dial 1 again to display “02” on the remaining columns of Display1, and press ENTER button.		
→ The current set value is indicated on Display2. Change the set value to “0” (Display 2 indicates “0”) and press ENTER button to return to the previous “select a group of DETAIL mode” process. Redo from the procedure “1. Select a mode”.		

7.1.3 Specifying CONTROL process

1) Setting procedure

1. Select a mode.

Press mode SELECT button several times until LED for WELD lights.



2. Specify a control process.

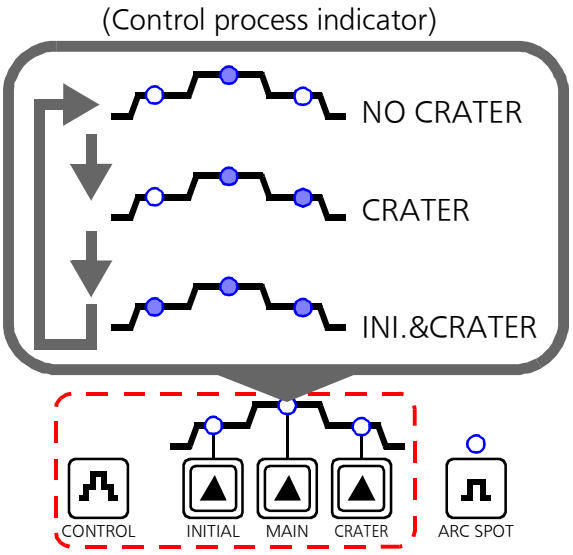
Press CONTROL button..
→ LEDs of Control process indicator corresponding to the selecting control process are lit. (See figure on the right.)

<Control process>

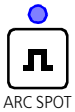
- NO CRATER (Main welding)
- CRATER(Main welding+Crater welding)
- INI.&CRATER (Initial welding+Main welding+Crater welding)

(Example: LCD when it is set to MAIN.)

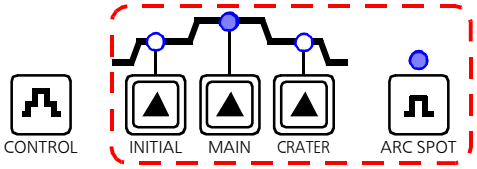
MAIN COMMAND



Press ARC SPOT select button.
→ LED above the button is lit.



→ If arc spot is selected, regardless of CONTROL process setting, it performs only main welding (just like setting to "NO CRATER".)
→ Use Output/Settings display2 select button to select TIME (arc spot time, unit: second).
→ Use Dial2 to specify arc spot time.
* Press ARC SPOT select button once again to cancel the arc spot setting.



2) Specifying welding current and voltage preset values.

<Control process and settable items>

Control process	INITIAL	MAIN	CRATER
NO CRATER	—	○	—
CRATER	—	○	○
INI.&CRATER	○	○	○
ARC SPOT	—	○	—

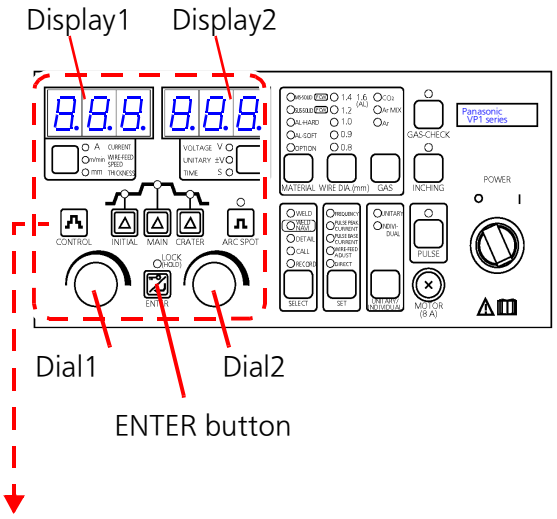
*O: Settable item

<Adjustment range of welding current/voltage preset values>

Item	Adjustable range [Increment]	
	Current (A)	Voltage (V)
INITIAL	30 to 400 [2]	12.0 to 38.0 [0.2]
MAIN	30 to 400 [2]	12.0 to 38.0 [0.2]
CRATER	30 to 400 [2]	12.0 to 38.0 [0.2]

<Adjustment range of Arc spot time>

0.3-10.0 [0.1] (Unit: second)



Press the button corresponding to the lighted LED.
→When the button is pressed, the lighted LED turns blinking.
* The item is settable while LED is blinking.

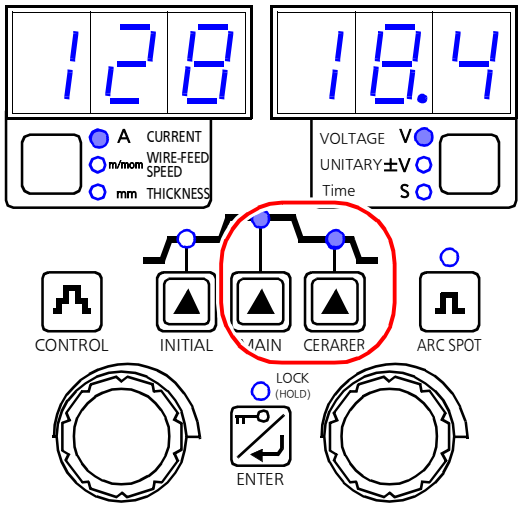
< Note >
At that time, the selected item is indicated on the first line of LCD in the upper right of the operation panel indicates.

Use Dial1 to specify a current preset value.
Use Dial2 to specify a voltage preset value.

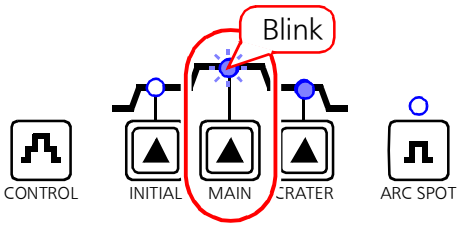
Press the button corresponding to the blinking LED to save the change.
→ The blinking LED turns solid.
* The item is not settable when LED is lit solid.

Note
Pressing a button updates the current value as set value.
Do not press any button carelessly.

(Example: Control process is "CRATER"
LEDs for MAIN and CRATER are lit.
(Main and crater welding set values are settable.)
→ Press MAIN button, then LED for MAIN blinks.



(Example: To change set value of MAIN welding)



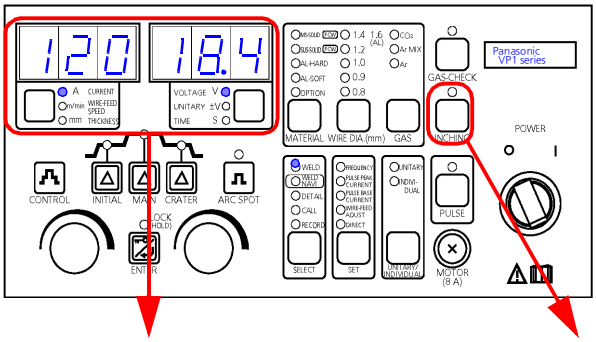
7.1.4 Checking INCHING function

Inching operation is applicable in WELD and CALL mode (when mode SELECT indicator for WELD or CALL is lit).

When mode SELECT indicator for WELD or CALL is lit

Inching operation is executed while holding down the INCHING button.

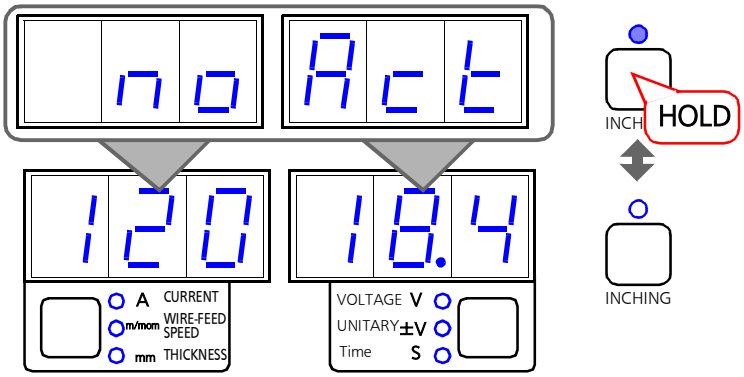
→ While the button is pressed, the LED above the button is lit.



In other modes, such as WELD NAVI., DETAIL or RECORD mode

Inching does not function.

→ Once the button is pressed, the message “no Act” is displayed on Displays1&2 as per the figure on the right.



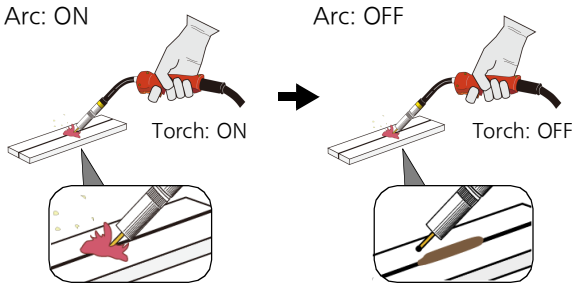
7.2 Welding

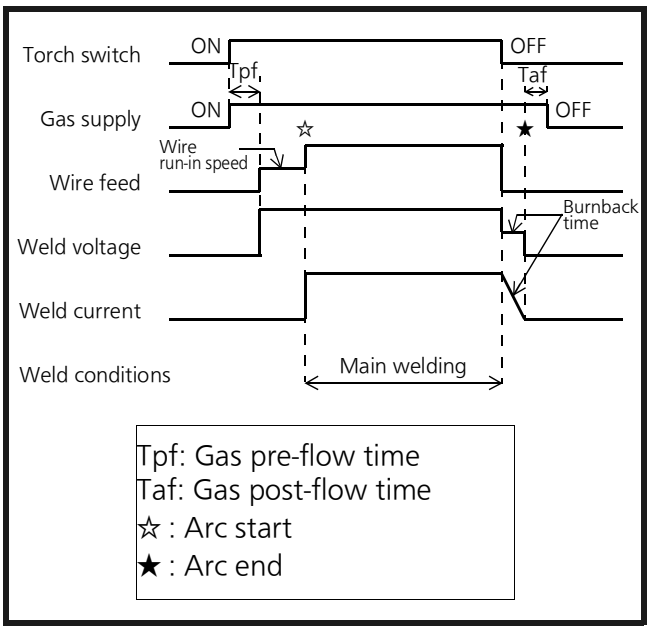
Here are some points of welding operation.

- There are three control processes to weld. Use CONTROL process select button to set.
- With CRATER and INI.&CRATER settings, it is possible to apply repetitive crater welding motion (crater repeat).
- The arc start error (Err6) occurs if voltage detection is not executed after turning on the torch switch. At that time, output is automatically turned off.
- In case of no arc (arc outage) state due to separating the torch from the base metal while welding, gas flow and wire feed stop, resulting in welding termination without error indication.

7.2.1 NO CRATER

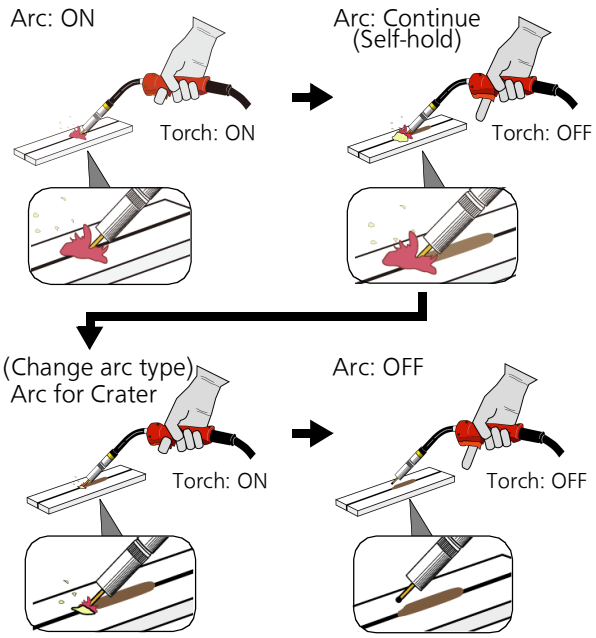
- Apply only main welding. (Initial welding and crater welding are not applicable.)
- Suitable for tack welding, repetitive welding of short weld section and thin plate welding.
- Operation: Turn on/off the torch switch to start/stop welding arc respectively.

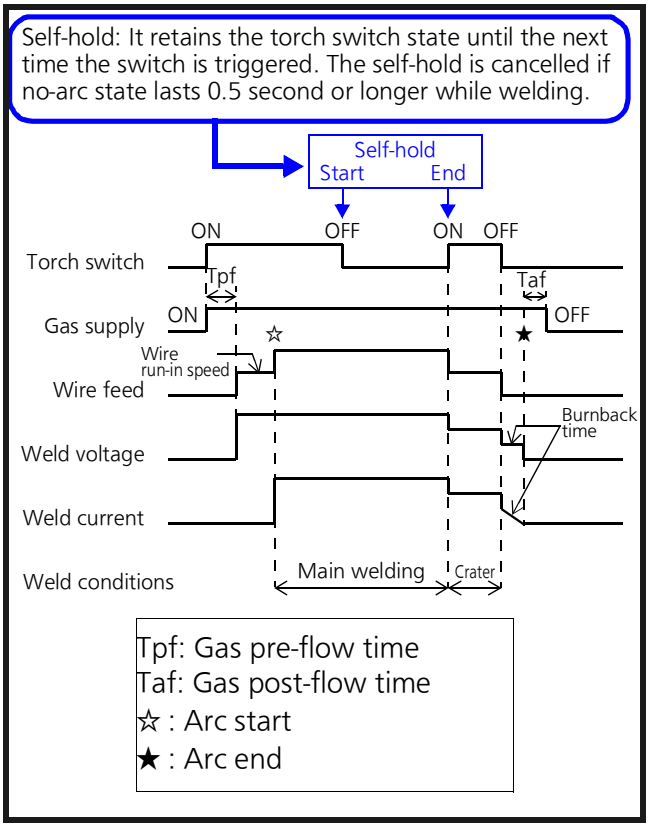




7.2.2 CRATER

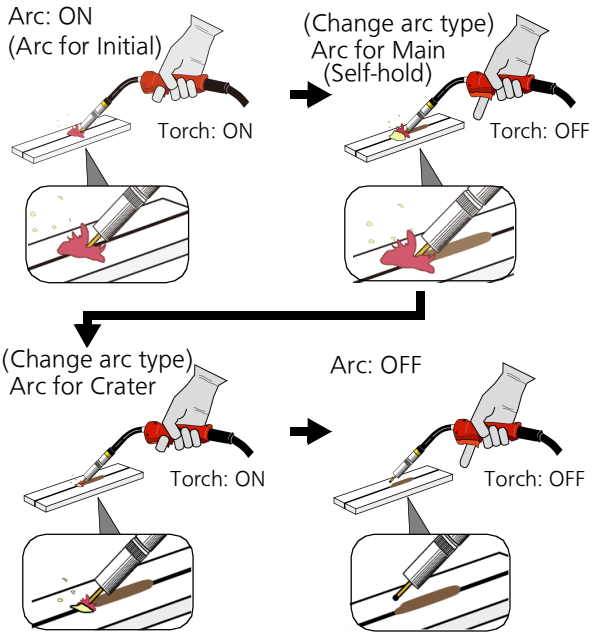
- Apply main welding followed by crater welding. (With crater welding, it is possible to fill the pit at the weld stop)
- Suitable for middle thick plate welding.
- Operation: Turn on/off the torch switch twice.



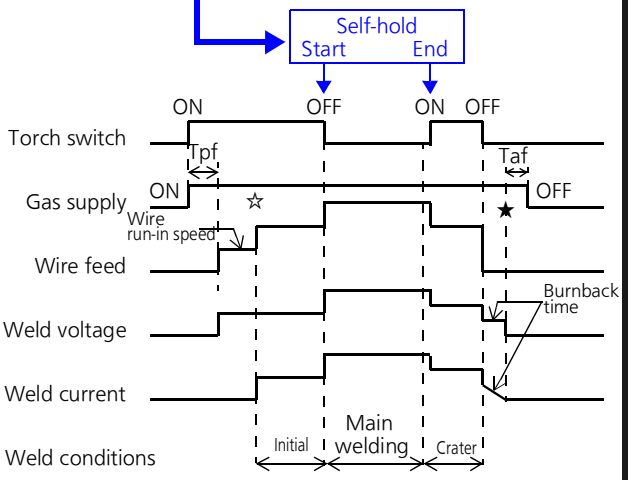


7.2.3 INI.&CRATER

- Apply welding operation at initial current (initial welding) before main welding, and then crater welding follows. Welding at initial current is effective for smooth arc start at the weld start.
- Operation: Turn on/off the torch switch twice. The section between the first torch on and the first off is the initial welding section.



Self-hold: It retains the torch switch state until the next time the switch is triggered. The self-hold is cancelled if no-arc state lasts 0.5 second or longer while welding.



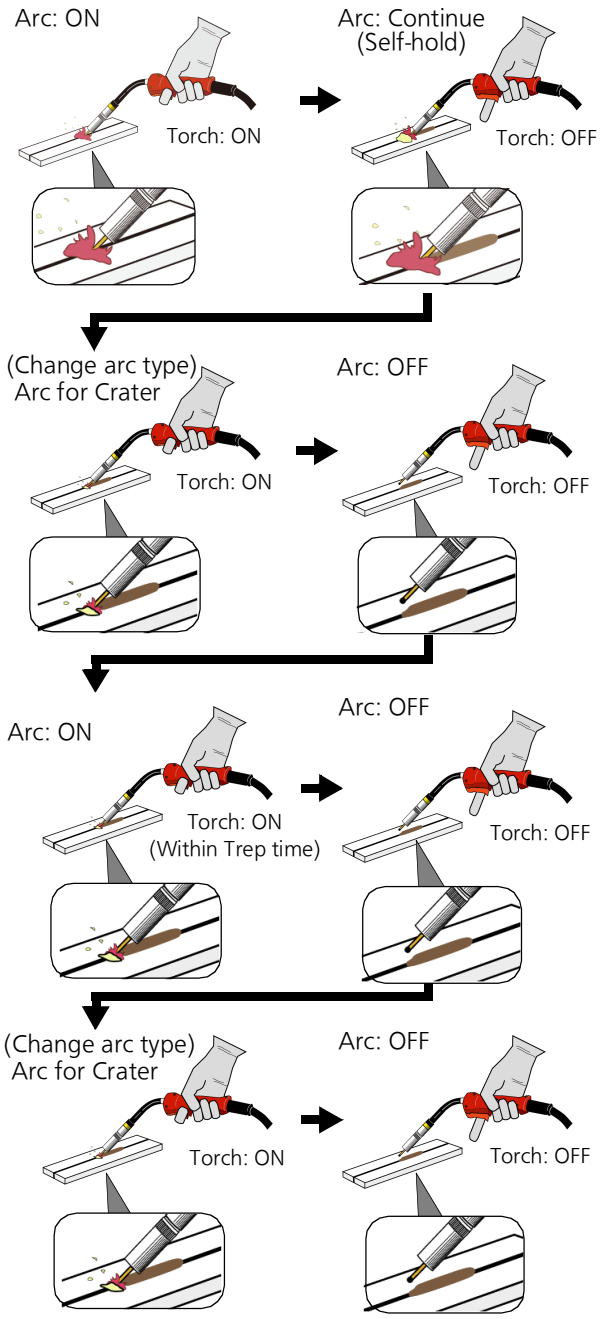
Tpf: Gas pre-flow time
Taf: Gas post-flow time
☆ : Arc start
★ : Arc end

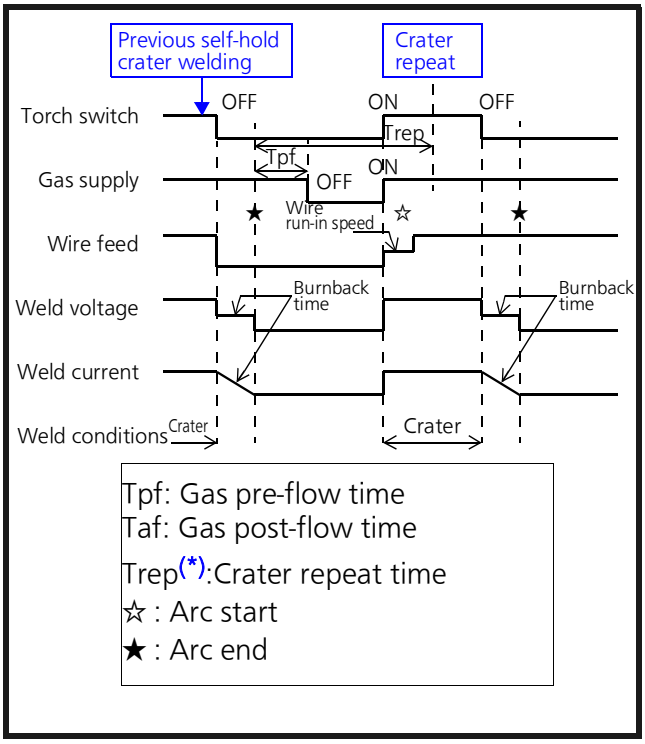
7.2.4 CRATER REPEAT

- By enabling the crater repeat (CRATER REP) setting, it is possible to apply repetitive crater operation in CRATER, INI.&CRATER. (See section “Detail mode: Group3: Submenu 00 on page 104)
- To repeat crater welding, turn on the torch switch in a certain time (Trep) after terminating the crater operation. It is possible to repeat this operation over and over.

Note

The crater repeat function is canceled if the torch switch is not turned on within the preset Trep time.

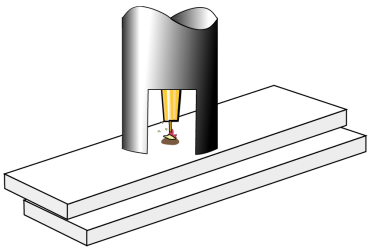




(*)Trep: It is possible to change crater repeat time. (See section "8.6 Group3: SYSTEM settings" on page 104 - group 3, submenu 17)

7.2.5 ARC SPOT

- In ARC SPOT welding, it is useful to use the arc spot nozzle: TGN01615 (sold separately).



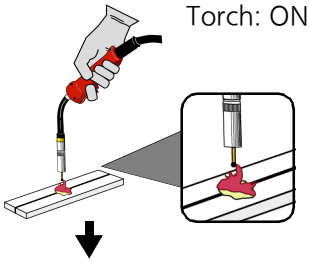
Arc spot welding using arc spot nozzle

- Suitable for lap welding of thin plates (thickness of about 1.0 mm).
- Hold the torch switch in the ON state (keep holding down) to weld.
- The arc automatically stops when the preset arc spot time is over.
- For arc spot time settings, see section "7.1.3 Specifying CONTROL process" on page 66.

Note

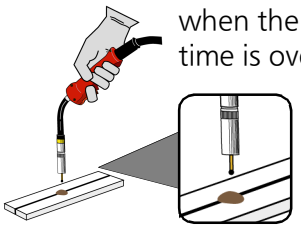
- The arc stops if the torch switch is turned off before the preset arc spot time is over.
- Initial welding and crater welding are not applicable.

Arc: ON



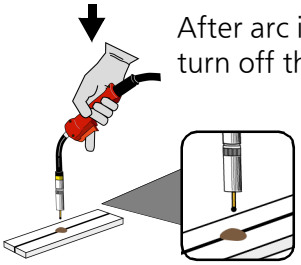
Arc: OFF

The arc automatically stops when the preset arc spot time is over.

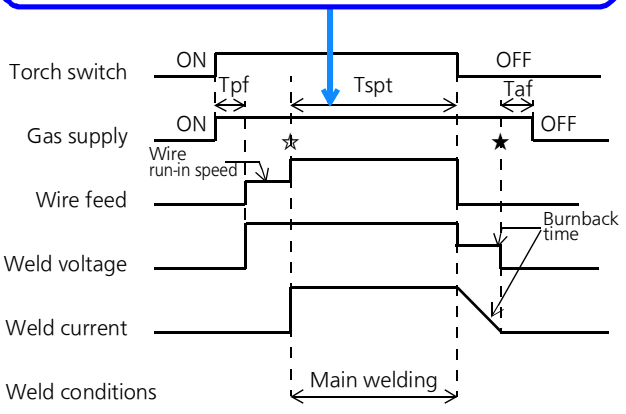


<Note>
The arc stops if the torch switch is turned off before the preset arc spot time is over.

After arc is stopped, turn off the torch switch



<Note> If the torch switch is turned off before the preset arc spot time, the arc immediately stops at that point.



7.2.6 Tips to improve welding activity

Here are some adjustment processes to improve welding activities.

* For DETAIL mode, see section "8.3 DETAIL" on page 82.

Note

Adjust carefully as making a vast change of parameters can make welding activities worse.

Improvement	Adjustment (Set value in DETAIL mode)	Submenu No. (DETAIL mode)
Reduce oxidation of welded part and base metal	• Extend the pre-flow time.	05
	• Extend the post-flow time.	06
	• Increase the shield gas flow rate. (Adjust customer prepared gas regulator.)	-
Make the ball at the end of wire at the arc end larger	• Extend the burnback time (see page 86).	03
	• Raise the FTT level.	02
Resolve wire stick	• Extend the burnback time (see page 86).	03
	• Raise the FTT level.	02
Make the wire burning at the weld start larger	• Increase the hot voltage.	01
	• Reduce the run-in speed (see page 86).	00
	• Extend the start time.	51
	• Extend the hot time.	52
	• Increase the hot current.	53
Eliminate kickback at arc start	• Reduce the FTT level.	02
	• Reduce the start slope.	50
In fillet welding, weld the corner accurately	• Reduce the voltage set value (Dial2).	-
Create soft arc	• Raise voltage set value (Dial2).	-
	• Reduce the wave control1 (see page 86).	13
	• Reduce the wave control2 (see page 86).	60
	• Reduce short-circuit current refractive value.	62
Create hard arc	• Increase the wave control1 (see page 86).	13
	• Increase the wave control2 (see page 86).	60
	• Increase the short-circuit current refractive value.	62
Perform high-speed welding	• Increase the wave control1 (see page 86).	13
	• Increase the wave control2 (see page 86).	60
	• Increase the short-circuit current refractive value.	62
	• Reduce voltage set value (Dial2).	-

《With PULSE》

Improvement	Adjustment (Set value in DETAIL mode)	Submenu No. (DETAIL mode)
Create soft arc	• Increase the voltage set value (Dial 2).	
Create hard arc	• Reduce the voltage set value (Dial 2).	
Concentrate the arc	• Reduce pulse peak time (see page 83).	17
With “Aluminum pulsed MIG welding”, create ripple of the bead	• Use “Low pulse” (see page 83)	20
In “Low pulse welding”, create clear ripple of the bead.	• Reduce low pulse levels (current) and/or (voltage) (see page 83).	21, 22
	• Increase the low pulse A:B ratio (see page 83).	24
In “Low pulse welding”, widen the ripple of the bead.	• Reduce the low pulse frequency (see page 83).	23
Resolve wire stick	• Increase the number of burnback pulse (see page 84).	58

8. Various settings

8.1 Setting THICKNESS

A function that selects a guideline welding conditions (current and voltage for main welding) by specifying the thickness of workpieces to be welded.

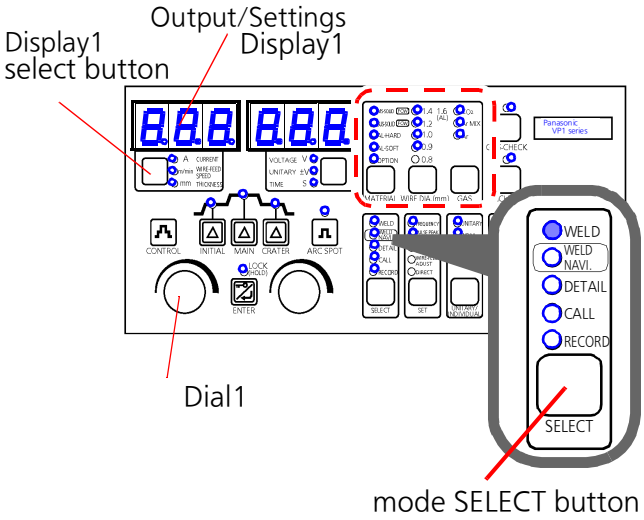
Note **About guideline welding conditions (welding current and voltage) the THICKNESS settings function automatically selects**

- With THICKNESS settings, it is possible to set welding conditions for the initial welding and crater welding, however, those set values need to be adjusted according to the welding conditions for main welding.
- Values automatically obtained by THICKNESS settings are not guaranteed values. They are indications obtained through the use of brand-new parts under the environment of our testing station.
- Use them as indications. Fine-tune them to suit for your workpiece.
- The standard settings are recommendation values for the case of fillet welding (joint type) at 0.3 m/min (welding speed). The leg length becomes 70 % when the thickness is 12 mm. The thinner the workpiece is the larger the leg length becomes. And the thicker the workpiece is, the smaller the leg length becomes.
- It is possible to adjust the recommended welding speed (see section “8.7 Group 4: CUSTOMIZATION settings” on page 114.)

1. Select a material, wire diameter, gas, control process and pulse.

① Specify a material, wire diameter and gas. (See section “7.1.2 Specifying welding conditions (material/wire diameter/gas and pulse)” on page 63.) For wire diameter and thickness, see the next page.)

② Specify a control process. (See section “7.1.3 Specifying CONTROL process” on page 66.)



2. Specify a thickness of workpiece to be welded.

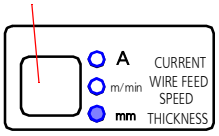
Press the Display1 select button several times until the LED on the left side of THICKNESS is lit.

Use Dial1 or Remote controller to set.

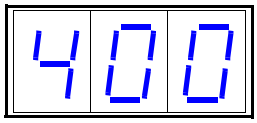
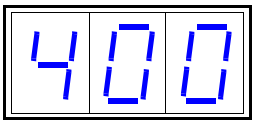
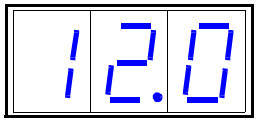
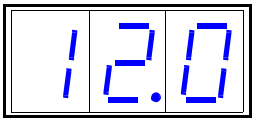
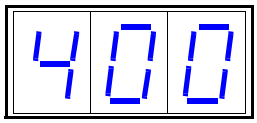
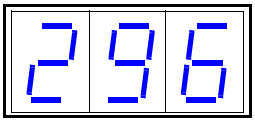
Welding current Adjuster

(Remote controller: YD-40GTR1)

Display1 select button



● For the following settings, setting values using the remote controller or using the Dial1 on the operation panel gives different current set value to be indicated on Display1

	Using remote controller	Using Dial1
① Select "A CURRENT" and specify a current value. (Example: Set to "400 A")	 (Item: CURRENT)	 (Item: CURRENT)
② Select "mm THICKNESS". (The value is not changed using remote controller/Dial1.) * With THICKNESS settings, current is automatically set. (Display1 does not indicate automatically set value.) (Example: If THICKNESS is 12.0, then current is automatically set to "296 A".	 (Item: THICKNESS)	 (Item: THICKNESS)
③ Select "A CURRENT" using a) Remote controller: The current value set in the previous procedure(1) takes a priority. (= 400 A) b) Dial1: Current (296 A) automatically set based on THICKNESS settings takes a priority.	 (Item: CURRENT)	 (Item: CURRENT)

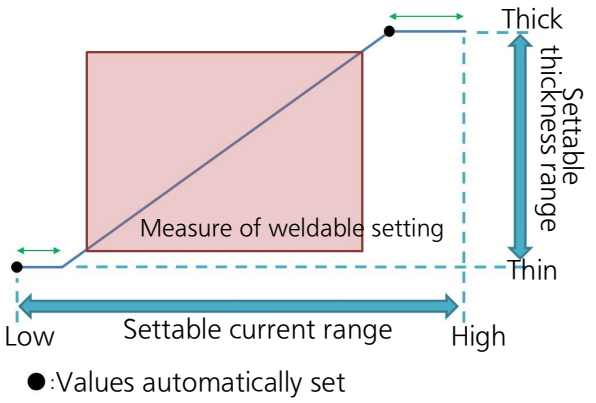
<Material-based thickness to wire diameter>

Wire material		Reference thickness [mm]					
		Mild steel	Stainless steel	Mild steel FCW (*)	Stainless steel FCW (*)	Hard aluminum	Soft aluminum
Wire diameter (mm)	0.8	0.8 to 4.5	0.8 to 3.0	-	-	-	-
	0.9	1.0 to 6.0	1.0 to 4.0	-	2.0 to 6.0	-	-
	1.0	1.0 to 9.0	1.0 to 9.0	-	-	1.0 to 6.0	-
	1.2	1.2 to 12.0	1.5 to 12.0	1.5 to 12.0	3.0 to 12.0	1.0 to 8.0	1.0 to 8.0
	1.4	2.3 to 16.0	-	3.2 to 12.0	-	-	-
	1.6	-	-	-	-	2.0 to 10.0	2.0 to 10.0

(*) FCW: Flux cored wire

Note Relationship between thickness and current value

- Proper current for each thickness has a range. The current value to be that is set automatically is the minimum value in the range.
- Actual settable thickness is beyond the above mentioned range (exceeds either upper/lower limit).



8.2 WELD NAVI.

WELD NAVI. (weld navigation) is a function that determines welding conditions (current and voltage for main welding) by specifying some setting items in order.

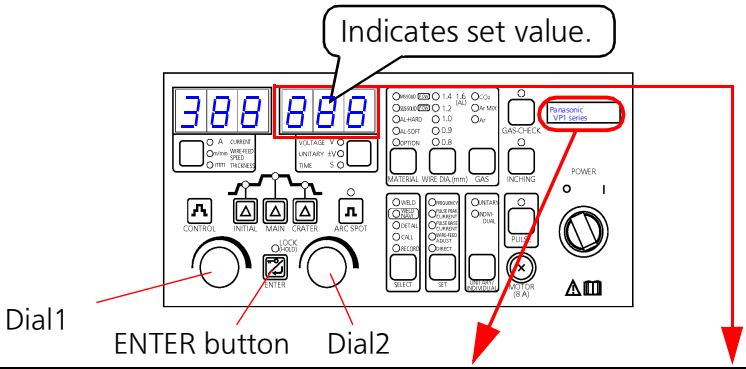
Note

- If WELD NAVI. is used to set welding conditions, perform the following operation to enable the remote controller to change current and voltage for main welding. At that time, LCD indicates "NAVI DISPLAY". (Only if "ANALOG RC" is set to "1 (Use)".))
- If "ANALOG RC" is set to "1 (use)", after determining the applied welding conditions, it is possible to fine-tune the set values according to the process described in section "7.1.3 2) Specifying welding current and voltage preset values." on page 67.
- Turn the adjuster on the remote controller counter-clockwise (down) to the end to reset welding conditions determined by WELD NAVI. Then, main welding current and voltage can be set by the remote controller.
- That is, if the adjuster on the remote controller is turned counter-clockwise(down) to the end, set values determined by the WELD NAVI. will be reset, therefore, automatic settings using WELD NAVI. won't function correctly.

8.2.1 Setting items

Note About WELD NAVI. setting items

- After setting welding conditions using WELD NAVI., if the power switch is turned off, those welding conditions are reset and welding conditions set by the remote controller are applied. (Those welding conditions won't be reset if "ANALOG RC" is set to "0 (not use)".)
- Use the welding current/voltage set values automatically set by WELD NAVI. as indications. Fine tune them to suit for your workpiece.
- The leg length becomes 70 % when the thickness is 12 mm. The thinner the workpiece is the larger the leg length becomes. And the thicker the workpiece is, the smaller the leg length becomes.



Submenu number
- Use Dial1 to select.
- Press ENTER to set.

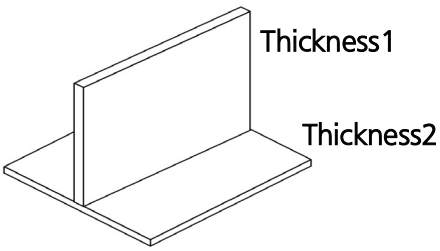
Set value
- Use Dial2 to select.
- Press ENTER to set.

No.	Contents	LCD	Set value	Setting range
1	Select joint type	JOINT SELECT -> 1.FILLET?	001	1.FILLET
			002	2.LAP
			003	3.BUTT
2	Thickness1 (mm) (*2)	THICKNESS1 -> (Minimum)(*1) mm?	(Minimum)(*1)	0.8 to 12.0 (*3) (Increment: 0.1)
			rEt	Return (go to previous setting item)
3	Thickness2 (mm) (*2)	THICKNESS2 -> (Minimum)(*1) mm?	(Minimum)(*1)	0.8 to 12.0 (*3) (Increment: 0.1)
			rEt	Return (go to previous item)
4	Welding speed (m/min.)	WELDING SPEED -> (Minimum)(*1) m/min?	(Minimum)(*1)	0.2 to 1.0 (*3) (Increment: 0.1)
			rEt	Return (go to "THICKNESS1" setting)

(*1) Minimum: the smallest value of the setting range of material, wire diameter or gas.

(*2) Thickness1, Thickness2: Thickness of workpieces to be welded.
*No particular order.
(See the figure on the right.)

(*3) Setting range for thickness varies with material, wire diameter and gas settings.



8.2.2 Setting procedure (WELD NAVI.)

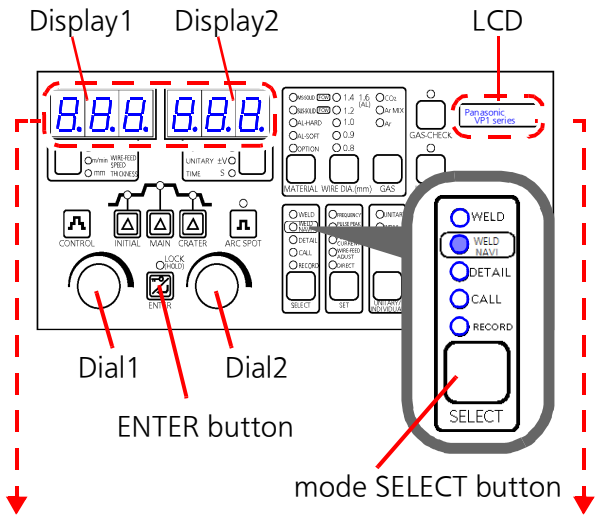
To quit the setting in the middle

Press mode SELECT button to return to the beginning of the current Mode settings.

1. Set material, wire diameter and gas. (See section "7.1.2 Specifying welding conditions (material/wire diameter/gas and pulse)" on page 63.)

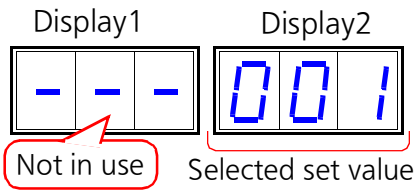
2. Select WELD NAVI. mode

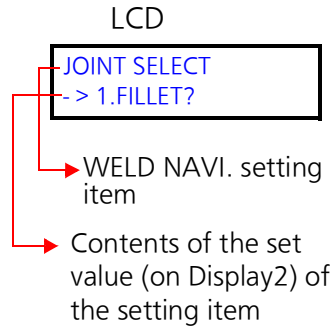
Press mode SELECT button several times until LED for WELD NAVI. is lit.



→ Setting item is indicated on the first line of LCD.
(The first item "JOINT SELECT")

→ Set value of the setting item is indicated on Display2.
Contents of the set value is indicated on the second line of LCD.



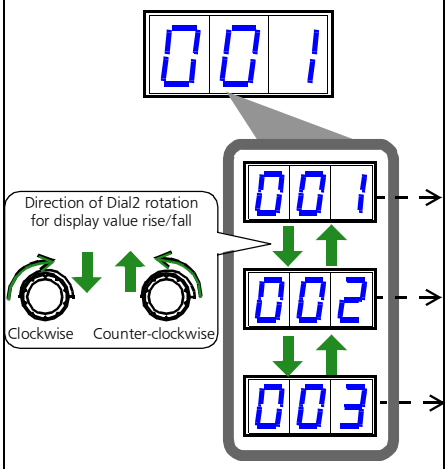


3. Set the indicated setting item.

→Turn Dial 2 to set WELD NAVI.

(Example: Select "1. FILLET")

Press ENTER button.



JOINT SELECT
- > 1.FILLET?

JOINT SELECT
- > 1.FILLET?

JOINT SELECT
- > 2.LAP?

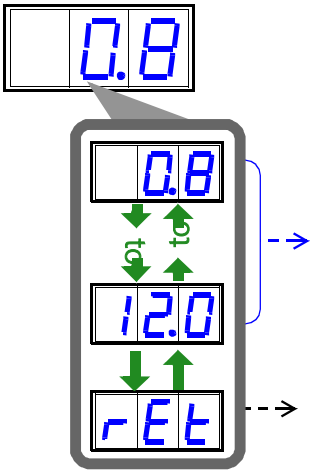
JOINT SELECT
- > 3.BUTT?

→Once the settings are saved, the next setting item is indicated on the first line of LCD.

Turn Dial2 until the desired set value for THICKESS1 is displayed.

Select "rEt" to return the previous setting item: JOINT SELECT.

Press ENTER button.



THICKNESS1
- > 0. 8 mm?

Set values vary with material, wire diameter, and gas. For example,
Mild steel, 1.2, CO_2:
→set value: 2.0 to 12.0
Mild steel, 0.8, CO_2:
→set value:0.8 to 6.0

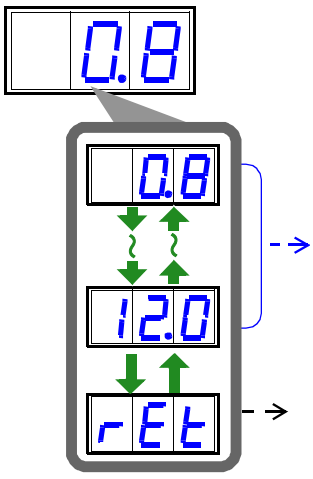
THICKNESS1
- > RETURN?

→Once the settings are saved, the next setting item is indicated on the first line of LCD.

Turn Dial2 until the desired set value for THICKNESS 2 is displayed.

Select "rEt" to return the previous setting item: JOINT SELECT.

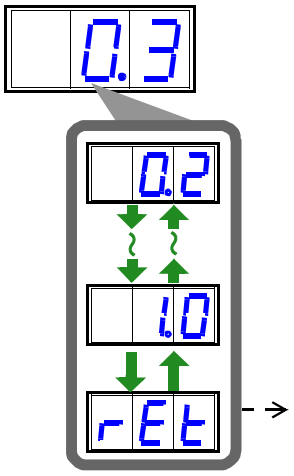
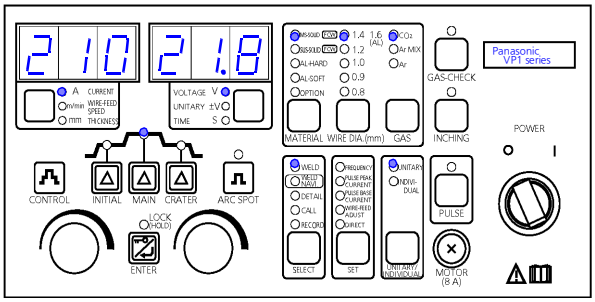
Press ENTER button.



THICKNESS2
- > 0. 8 mm?

Set values vary with material, wire diameter, and gas. For example,
Mild steel, 1.2, CO_2:
→set value: 2.0 to 12.0
Mild steel, 0.8, CO_2:
→set value:0.8 to 6.0

THICKNESS2
- > RETURN?

→ Once the settings are saved, the next setting item is indicated on the first line of LCD. Turn Dial2 until the desired set value for WELDING SPEED is displayed. Select "rEt" to return the previous setting item: THICKNESS 1. Press ENTER button.		WELDING SPEED - > 0.3 m/min? WELDING SPEED - > RETURN?
→ The operation panel indicates the automatically selected welding conditions.		

8.3 DETAIL

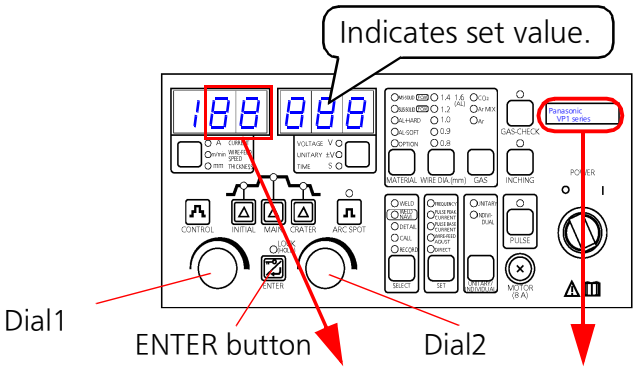
DETAIL mode has the following four setting groups with submenus. A group number is indicated on the far left column of Display1 and the submenu on the remaining columns of Display1.

- Group1: ADVANCED (Welding parameters) settings (see page 82)
  * Not applicable for robotic welding.
- Group2: MANAGEMENT related settings (see page 95)
- Group3: SYSTEM settings (see page 104)
  * Not applicable for robotic welding.
- Group4: CUSTOMIZATION settings (see page 114)
  * Not applicable for robotic welding.

8.4 Group1: ADVANCED (welding parameters) settings

8.4.1 Setting items

(*Submenu numbers not in use are ignored.)



Submenu number
- Use Dial1 to select.
- Press ENTER to set.

Set value
- Use Dial2 to select.
- Press ENTER to set.

Set item	Submenu #	LCD display (1st line)	Setting range	Increment	Default
Run-in speed (*1)	00	RUN-IN SPEED	-50 to 50	1	0
Hot voltage	01	HOT VOLTAGE	-50 to 50	1	0
FTT level(*4)	02	FTT LEVEL	-99 to 99	1	0
Burnback time (*1)(*4)	03	BURNBACK TIME	-99 to 99	1	0
(*1)(*4) Penetration adjustment	04	PENETRATION	-30 to 30	1	0
Pre-flow time (second)	05	PRE-FLOW TIME	0 to 10.0	0.1	0.2
Post-flow time (second)	06	POST-FLOW TIME	0 to 10.0	0.1	0.5
Pulse peak current adjustment	07	PULSE PEAK CUR	-99 to 99	1	0
Pulse base current adjustment	08	PULSE BASE CUR	-99 to 99	1	0
Fine tune of pulse rise	09	PULSE RISE CUR	-30 to 30	1	0
Fine tune of pulse fall	10	PULSE FALL CUR	-30 to 30	1	0

Set item	Submenu #	LCD display (1st line)	Setting range	Increment	Default
Wire feed fine adjustment (*1)	11	WFS FINE ADJ	-50 to 50	1	0
Wave control1 (*1)	13	WAVE CONTROL 1	-99 to 99	1	0
Pulse frequency(*2)	14	PULSE FREQ	-99 to 99	1	0
Fine tune of pulse peak ON time	17	PULSE WIDTH	-99 to 99	1	0
No crater pulse	18	CRATER DC	0: Invalid 1: Valid	-	0
No initial pulse	19	INIT PLS DC	0: Invalid 1: Valid	-	0
Low pulse setting (*1)	20	LOW PULSE SET	0: Invalid 1: Valid 2: Automatic (*3)	-	0
(*1) Low pulse level: Current	21	LOW PULSE CUR	30 to 400	2	120
(*1) Low pulse level: Voltage	22	LOW PULSE VOL	5 to 50	0.2	20.2
Low pulse frequency (*1)	23	LOW PULSE FREQ	0.5 to 10	0.1	2.0
Low pulse A-B ratio (*1)	24	LOW PULSE DUTY	10 to 90	5	50
Low pulse delay time (*1)	25	LOW PUOLSE DELAY	0 to 9.9	0.1	0
Result display time (second)	30	DISPLAY TIME	1 to 30	1	5
(*1) Control of penetration increase	32	PENET INC	0: Invalid 1: Valid 2: Automatic	-	2

(*1) Terms are described later in this section.
(*2) "Pulse frequency" is not adjustable if the material is set to "AL-HARD (hard aluminum)" or "AL-SOFT (soft aluminum)".
(*3) When "Low pulse setting" is set to "2. Automatic", the "Low pulse delay time" becomes "0" and cannot be adjusted.
(*4) Applicable only to "PULSE [OFF]" setting.

The following setting items require administrator's password.

Set item	Submenu #	LCD display (1st line)	Setting range	Incre-ment	Default
Enter password	40	INPUT PASSWORD	0 to 255	1	123
Change password	41	CHANGE PASSWORD	0 to 255	1	123
Panel	42	PANEL LOCK	0: Invalid 1: Valid	—	0
Short arc level	45	SA LEVEL	-99 to 99	1	0
Arc short level	46	AS LEVEL	-99 to 99	1	0
Start slope	50	START SLP	-50 to 50	1	0
Start time	51	START TIME	-99 to 99	1	0
Hot time	52	HOT TIME	-50 to 50	1	0
Hot current	53	HOT CURRENT	-99 to 99	1	0
Number of initial pulse	54	INIT PCOUNT	-10 to 10	1	0
Fine-tune of initial base pulse current	55	INIT PLS IB CUR	-99 to 99	1	0
Fine-tune of initial peak pulse current	56	INIT PLS IP CUR	-99 to 99	1	0
Fine-tune of initial pulse frequency	57	INIT FREQ	-99 to 99	1	0
Number of burnback pulse	58	BBK PULSE	-5 to 5	1	0
End shift voltage	59	END SHIFT VOLT	-99 to 99	1	0
Wave control2	60	WAVE CONTROL 2	-99 to 99	1	0
IAC	61	IAC	-99 to 99	1	0
Short-circuit refractive value	62	ISC	-50 to 50	1	0
Reactance adjustment	66	ELI	-50 to 50	1	0
Pulse rise time adjust-ment	70	PRISE	-99 to 99	1	0
Pulse fall time adjust-ment	71	PFALL	-99 to 99	1	0
Reactance adjust-ment2	72	ELI 2	-50 to 50	1	0
IAC duration	73	IAC DURATION	-99 to 99	1	0
Arc blow control	74	P CTRL BLOW	0 to 3.0	0.1	0
CDM function (*)	80	CDM	0: Invalid 1: Valid 2: Automatic	—	2

Set item	Submenu #	LCD display (1st line)	Setting range	Increment	Default
Impulse start	81	IMPULSE START SW	0: Invalid 1: Valid 2: Automatic	—	2
End pulse settings	83	ENDPLS	0: Invalid 1: Valid 2: Automatic	—	2
Burnback2	84	BURNBACK 2	0: Invalid 1: Valid	—	0
Initial condition: Current	88	INIT COND CUR	-50 to 50	2	0
Initial condition: Voltage	89	INIT COND VOL	-50 to 50	2	0
Initial condition: Time	90	INIT COND TIME	-99 to 99	1	0
Initial start slope	91	INIT START SLOP	-99 to 99	1	0
Initial down slope	92	INIT DOWN SLOP	-99 to 99	1	0
Initial current limit	93	INIT LIMIT CUR	-50 to 50	2	0
Crater condition: Current	94	CRAT COND CUR	-50 to 50	2	0
Crater condition: Voltage	95	CRAT COND VOL	-50 to 50	2	0
Crater condition: Time	96	CRAT COND TIME	-99 to 99	1	0
Crater down time	97	CRAT DOWN SLOP	-99 to 99	1	0
Crater skip time	98	CRAT SKIP TIME	-99 to 99	1	0

(*1) CDM(Current Detect Mask): It reduces wire feed speed at arc start.

<Terms description>

Run-in speed

It slows down the wire feed speed immediately after turning on the torch switch in order to obtain solid arc start.

Burnback time

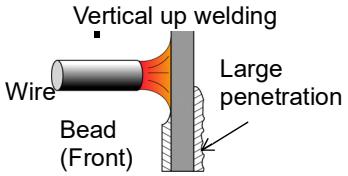
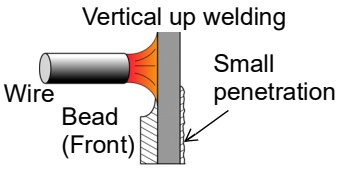
It is a duration of time to keep supplying the output voltage after turning off the torch switch to stop welding operation. It is to burn off the wire extruding from the end of the torch due to motor inertia.

< Note >

Applicable only to "PULSE [OFF]" setting.

Penetration adjustment

Fine tune the penetration

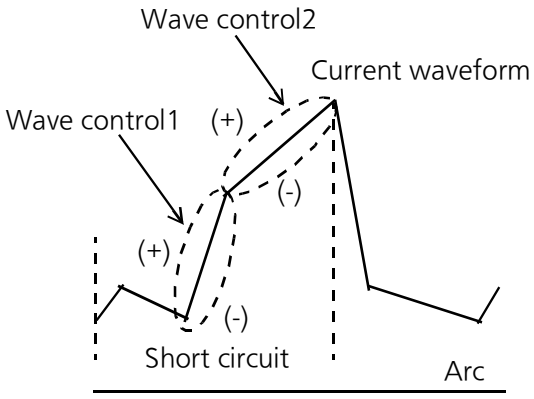
	Application example
Standard (0)	• Normal usage.
To positive (+) direction	• To increase penetration • Effect: Ensure penetration. 
To negative (-) direction	• To reduce penetration • Effect: Prevent burn through 

Wire feed fine adjustment

It fine-tunes the wire feed speed without changing current waveform at welding. (unit: %)

Wire feed speed
=Preset value+(Preset value x Adjustment value)

Wave control



It fine-tunes the current waveform at initial short circuit portion of short circuit current.

Standard (0): Normal setting.

Adjust to "-" direction: To obtain soft arc or reduce spatter.

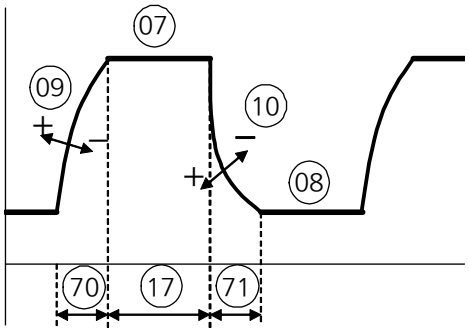
Adjust to "+" direction: To obtain hard arc or improve arc stability in high speed welding.

About pulse welding

Arc width changes by change pulse waveform.

Note

Changing the pulse waveform significantly will block the action of globular transfer in pulse welding and cause generation of spatter.



【User setting items】

Submenu #	LCD display (1st line)	Remarks
07	PULSE PEAK CUR	It adjusts the pulse peak current.
08	PULSE PEAK VOL	It adjusts the pulse base current.
09	PULSE RISE CUR	It adjusts the pulse rise current. Adjust to + side for steeper slope.
10	PULSE FALL CUR	It adjusts the pulse fall current. Adjust to + side for steeper slope.
14	PULSE FREQ	It adjusts the pulse frequency.(*)
17	PULSE WIDTH	It fine-tunes the pulse peak on time in pulse welding.
18	CRATER DC	It specifies whether to use pulse in crater fill operation in pulse welding.
19	INIT PLS DC	It specifies whether to use pulse in initial welding operation in pulse welding.

(*): "Pulse frequency" is not adjustable if the material is set to "AL-HARD (hard aluminum)" or "AL-SOFT (soft aluminum)".
Adjust the pulse frequency in the following manner if needed. Do not change the pulse frequency significantly, otherwise, it can cause spatter generation and wire burning.

- To increase the frequency, reduce the pulse peak current or pulse base current.
- To reduce the frequency, increase the pulse peak current or pulse base current.

[Administrator setting items]

The following items require the administrator's password to set. See submenu 40 of Group 1 in DETAIL mode on page 93.

Submenu #	LCD display (1st line)	Remarks
58	Number of burnback pulse	Adjust the number of pulse at the weld end point. If the wire stick occurs frequently, increase this value.(*)
70	PRISE	It fine-tunes pulse rise time. Adjust to + side for longer rise time.
71	PFALL	It fine-tunes pulse fall time. Adjust to + side for longer fall time.
74	P COTRL BLOW	It specifies arc blow control level in pulse welding.
83	ENDPLS	It specifies whether to apply pulse (on) or not (off) at the end of welding operation.

(*): In "PULSE [ON]" settings, FTT level (see submenu "02" of "Detail group 1") and burnback time (see sumbenu "03" of "Detail group 1") adjustment are not applicable. In such case, adjust "number of burnback pulse" to avoid wire stick.

Low pulse setting (20)

Low pulse welding is to create ripples of the bead specific to the low pulse welding by bringing the level of Condition B part lower than the level of Condition A part periodically. The setting is not applicable in "2. Automatic" setting as the low pulse delay time becomes zero (0).

Low pulse level: Current/Voltage (21 and 22)

Condition A becomes the normal pulse condition.

Condition B is ignored if the LOW PULSE SET is set to "0 (Invalid)".

Note

The lower the level is, the more frequently the specific ripple of the bead is created. Then, short circuit occurs in Condition B part more frequently.

Low pulse level: Voltage (22)

Before entering DETAIL mode,

- if UNITARY indication is selected, the unitary voltage of low pulse current is indicated.
- if difference UNITARY (±V) is selected, the voltage different from the UNITARY is indicated.
- if INDIVIDUAL is selected, the INDIVIDUAL voltage is inidcated.

Low pulse frequency (23)

The higher the frequency is, the shorter the distance between the specific ripples.

Low pulse A-B ratio (24)

In low pulse, set the ratio of width of Condition A to the sum of the widths of Conditions A and B.

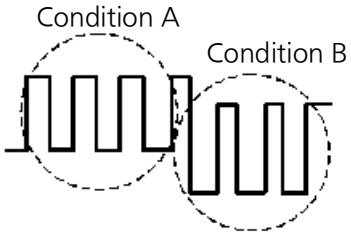
- Then, the width (%) of Condition B is [100 - Ratio of width of Condition A] (%)
- The figure on the right shows the LOW PULSE DUTY at default setting (50 %): That is, both Conditions are the same width (ratio) (50:50 (%)).

Low pulse delay time (25)

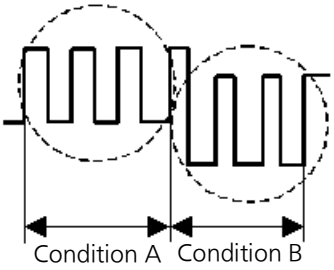
Adjust to (+) direction delays the time to start low pulse. Take into account the welding speed and set it so as to start low pulse welding from the desired point.

[* (⎍) is the simplified form of the pulse current waveform (∿).]

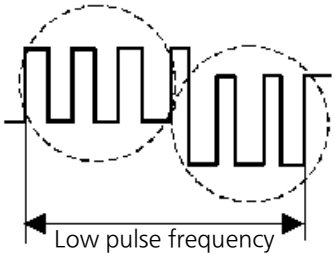
<Low pulse setting>



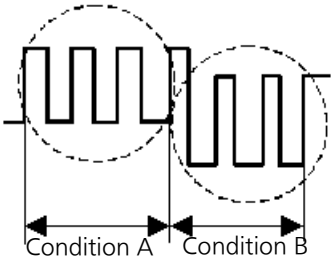
<Low pulse level: Current/Voltage>



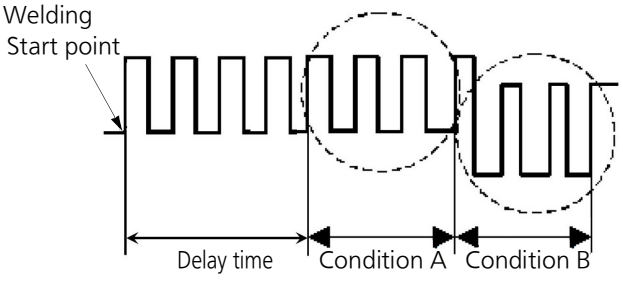
<Low pulse frequency>



<Low pulse A-B ratio>



<Low pulse delay time>



Control of penetration increase (32)

<Function>

It is possible to adjust penetration at arc start. It is also possible to conduct welding operation using the same start sequence at every start to operate independently from the torch switch signal.

<Setting procedure>

Set the submenu 32 to "1: Valid" to enable this control of penetration increase function, that is, parameters of the submenus 88 and 98 become settable. For details, see the following table and figures

Submenu #	LCD display (1st line)	Remarks
32	PENET INC	0: Invalid, 1: Valid, 2: Automatic

[Administrator setting items]

The following items require the administrator's password to set. See submenu 40 of Group 1 in DETAIL mode on page 93.

Submenu #	LCD display (1st line)	Remarks
88	INIT COND CUR	It adjusts the current value of the main welding of the initial condition.
89	INIT COND VOL	It adjusts the UNITARY voltage value for the current value of the initial condition.
90	INIT COND TIME	It adjusts the initial condition time.
91	INIT START SLOP	It fine-tunes the start slope time of the initial condition.
92	INIT DOWN SLOP	It fine-tunes the down slope time of the initial condition.
93	INIT LIMIT CUR	It adjusts the current limit of the initial condition using the current value of the main welding current value.
94	CRAT COND CUR	It adjusts the crater value of the crater condition using the current value of the main welding current value.
95	CRAT COND VOL	It adjusts the UNITARY voltage value for the current value of the crater condition
96	CRAT COND TIME	It fine-tunes the crater condition time.
97	CRAT DOWN SLOP	It adjusts the transition time from the main welding to crater condition.
98	CRAT SKIP TIME	Use it to disable the crater control. If the torch switch is turned off within the preset "CRAT SKIP TIME", the crater control operation is ignored.

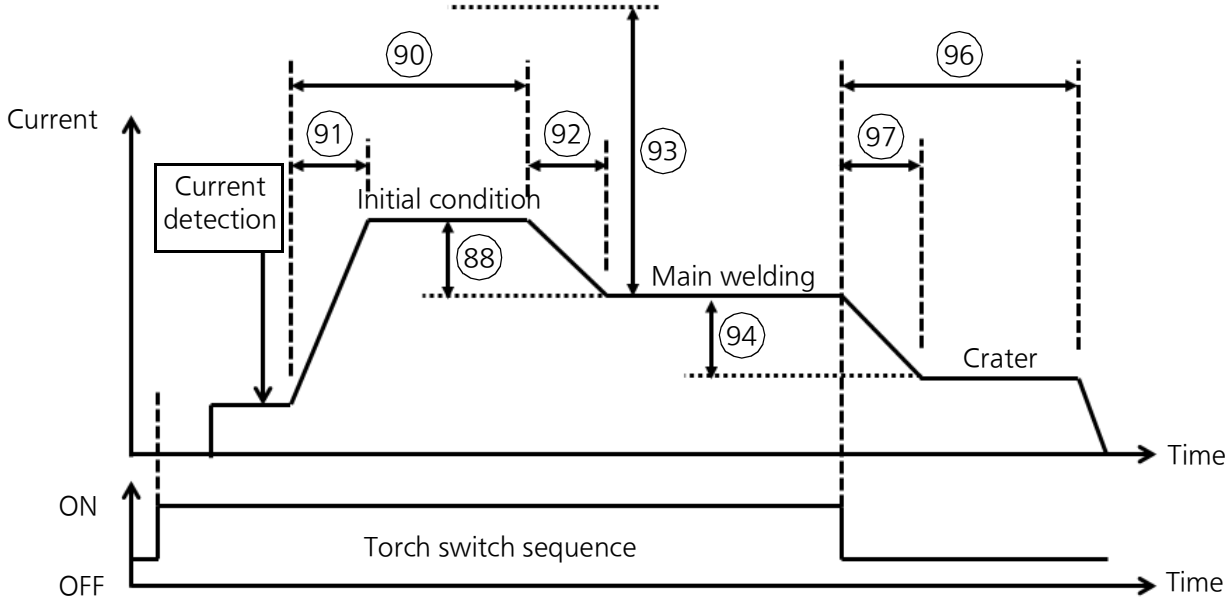
Note

- Changing the pulse waveform significantly will block the action of globular transfer in pulse welding and cause generation of spatter.
- Setting this function effective validates the crater condition as well as the initial condition.

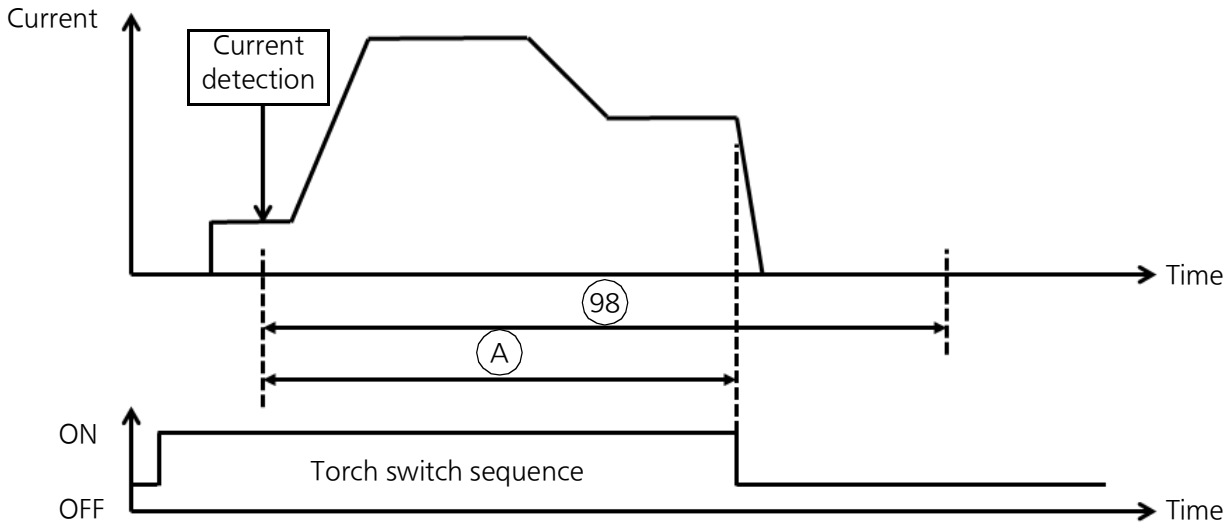
To disable the crater control, set the "CRAT SKIP TIME (Submenu 98) longer than the time from the current detection to the end of main welding (Ⓐ). See the [Fig.1] on page 90 for the current sequence.

About current sequence and parameters

[Fig.1]



Current sequence when the crater control is disabled.
(Time from "Current detection" to "End of the main welding" (Ⓐ) < Crater skip time)

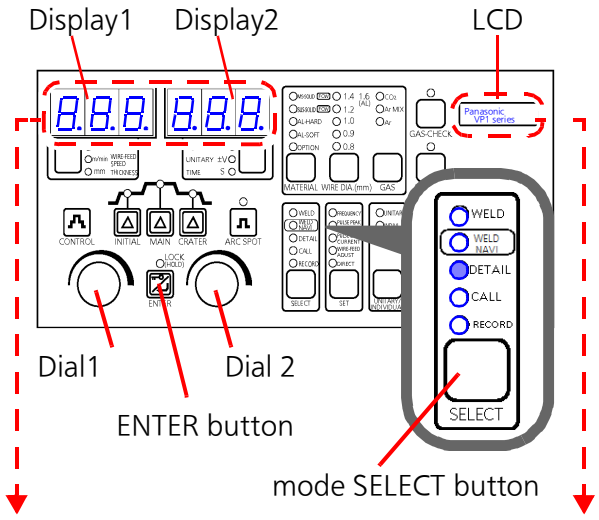


8.4.2 Setting procedure (welding parameters)

To quit the setting in the middle
Press mode SELECT button to return to the beginning of the current Mode settings.

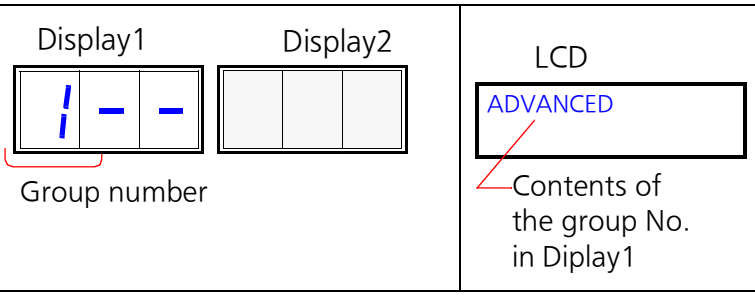
1. Select DETAIL mode

Press mode SELECT button several times until LED for DETAIL is lit.



→ The far left column of Display1 indicates "1" for Group 1.

Press ENTER button.

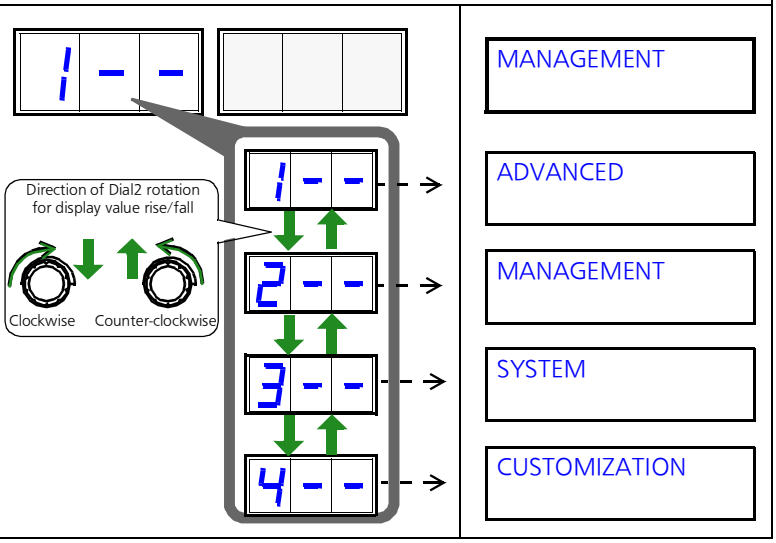


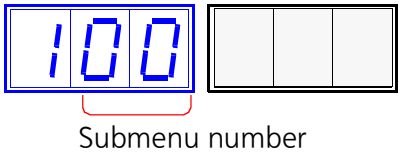
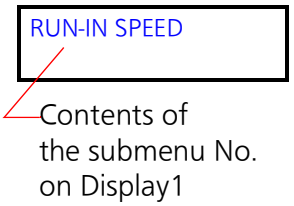
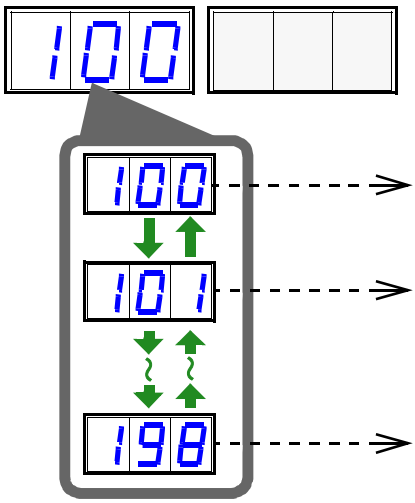
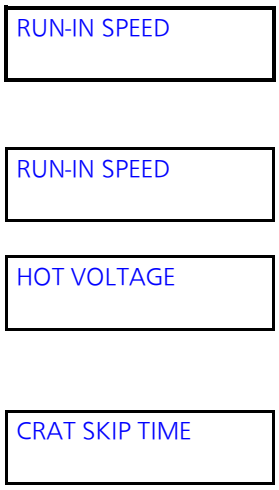
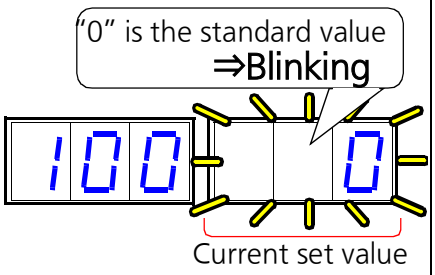
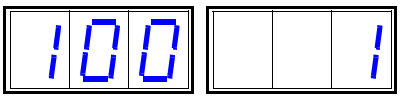
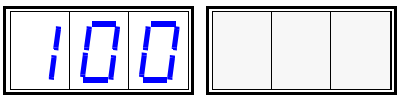
2. Specify a DETAIL group

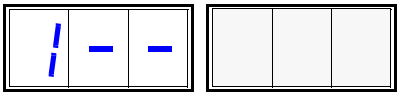
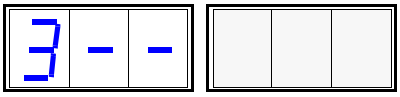
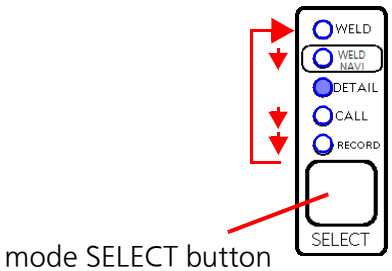
Turn Dial1 until the desired group number (1 to 4) is displayed.

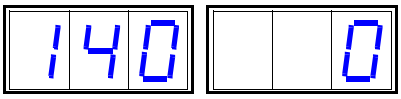
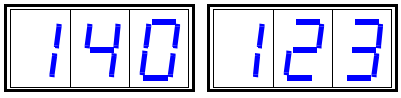
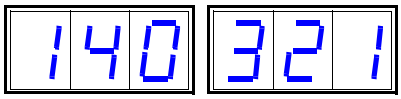
(Example: Select group 1.)

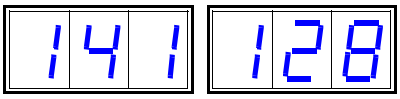
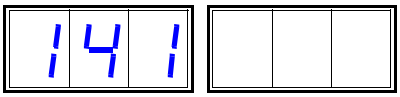
Press ENTER button.



	→Display "00" (submenu No.) on the remaining columns of Display1. → The contents of the specified submenu is indicated on LCD.		
3.	Specify a submenu.		
	Turn Dial1 to display a desired submenu No. (00 to 99). * Check with submenu No. on Display1 and/or its contents on LCD. * For menu Nos. not in use: Those menu numbers are indicated on Display1 with "----" on LCD as they have no contents. (Example: Specify submenu "00" with "Run-in Speed". Press ENTER button.		
	→ The standard value is indicated on the second line of LCD. → The current set value is indicated on Display2. * If the current set value is the standard value, the value on Display2 blinks. If not, the value lights solidly.		
4	Change the set value of the submenu.		
	Turn Dial2 until the desired set value of the submenu is displayed on Display2. (Example: Set "1".) Press ENTER button.		
	→ Display2 is cleared. → Display1 becomes selectable.		
5.	To edit other submenus of the mode.		
	Repeat the previous procedures 3 (Specify a submenu) and 4 (Change the set value of the submenu) for each submenu you want to edit. (See section "8.4.1 Setting items" on page 82.)		

6.	To exist from this group and edit another group of DETAIL mode:		
	Press mode SELECT button once.		ADVANCED
	Turn Dial until the desired group number (1 to 4) is displayed. (Example: Select group “3”)		SYSTEM
7.	To exit from DETAIL mode:		
	Press mode SELECT button several times until LED for the desired mode is lit.		

How to enter the password (Submenu 40: Enter password)			
	Turn Dial2 until “40” (submenu 40) is displayed on Display1, and then press ENTER button.		INPUT PASSWORD
	Turn Dial2 to display password on Display2, and then press ENTER button. (Default password is “123”.) If the password is correct, “OK” is displayed on LCD. → Display2 is cleared. → Display1 becomes selectable.		INPUT PASSWORD OK Display “OK”
	* If the password is wrong, “OK” won’t be displayed on LCD. Press ENTER button and then re-enter the password.		INPUT PASSWORD Do not display “OK”

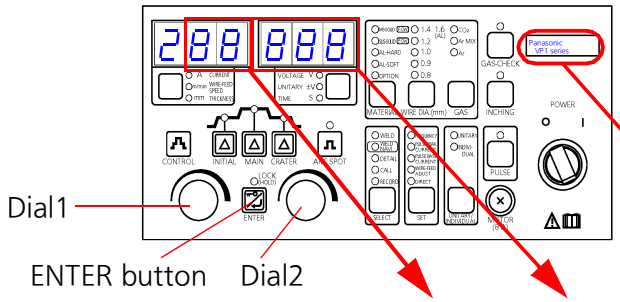
How to change the password (Submenu 41: Change password)		
Turn Dial2 until “41” (submenu 40) is displayed on Display1, and then press ENTER button.		CHANGE PASSWORD STANDARD VALUE : 123
→ Display2 indicates the current password. Turn Dial2 to display the new password on Display2, and then press ENTER button. → Display2 is cleared. → Display1 becomes selectable.		INPUT PASSWORD

8.5 Group2: MANAGEMENT related settings

8.5.1 Setting items

(*Submenu numbers not in use are ignored.)

Use it to specifies the display item on the second line of LCD if there is no items (contents or set value) to indicate.



Submenu number
- Use Dial1 to select.
- Press ENTER to set.

Set value
- Use Dial2 to select.
- Press ENTER to set.

Contents Monitoring item to be displayed	Submenu #	Monitoring #	LCD display (1st line)	Max. display value
Nothing	00	0	SUB-MONITOR 0.OFF	-
Motor rotation frequency(*1) 「M1: ***.* rpm」		1	SUB-MONITOR 1.MOTOR (RPM)	999.9 rpm
Motor current value (*1) 「M2: **.* A」		2	SUB-MONITOR 2.MOTOR (A)	99.9 A
Number of short circuit (*1) (*3) 「M3: ***」		3	SUB-MONITOR 3.SHORT COUNT	999
Number of welding (*2) 「M4: *****」		4	SUB-MONITOR 4.WELDING COUNT	30 000
Arc time (*2) 「M5: ****h **m **s」		5	SUB-MONITOR 5.ARC TIME	9 999 h 59 m 59 s
Amount of wire used (*2) 「M6: ***.* kg」		6	SUB-MONITOR 6.WIRE USAGE	999.9 kg
Fan rotation time (*2) 「M7: ****h **m **s」		7	SUB-MONITOR 7.FAN ROT TIME	9 999 h 59 m 59 s
Primary input voltage (*1) 「M8:***V ***V ***V」		8	SUB-MONITOR 8.INPUT PRE-VOLT	-

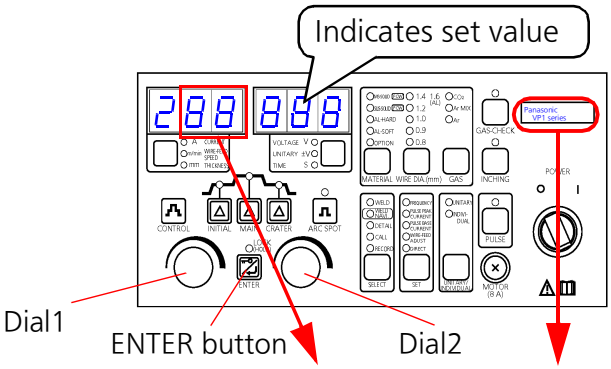
(*1) It indicates the current value. Use it only as a guide.

(*2) To count the item, it is necessary to set the counter for each of those items ON.

To set a target value, change the "Target value" for each of those items. ("Target value" is factory set to the maximum value at shipment.)

Monitoring item	Submenu No.	
	Valid/Invalid setting	Target value
Welding count	40	42
Accumulated arc time	50	52
Wire usage	60	62
Fan rotation time	70	72

(*3) When PULSE is selected, the LCD display always indicates zero (0).
It won't indicate "Number of short circuit."



Submenu number
- Use Dial1 to select.
- Press ENTER to set.

Set value
- Use Dial2 to select.
- Press ENTER to set.

Contents		Sub-menu No.	LCD display (1st line)	Setting range	Increment	Default
Output management function						
Motor current upper limit detection	Motor current upper limit detection **ON/OFF**	**10**	MTR(A) MONITOR	0: OFF 1: ON	-	0
	Motor current upper limit detection time (s)	**11**	MTR(A) DETECT T	0.1 to 99.9	0.1	1.0
	Motor current upper limit set value (A)	**12**	MTR(A) UP-LIMIT	1.0 to 5.0	0.1	3.0
	Contact output at motor current upper limit detection **ON/OFF**	**13**	MTR(A) MON CONTACT	0: OFF 1: ON	-	0
	Motion at motor current upper limit detection	**14**	MTR(A) DET MOVE	0: Continue (Indication only) 1: Stop at the end of the current welding. Then press ENTER button to reset.	-	0
Welding current upper/lower limit detection	Welding current upper/lower limit detection ON/OFF	**20**	WELD(A) MONITOR	0: OFF 1: ON	-	0
	Welding current upper/lower limit detection time (s)	**21**	WELD(A) DETECT T	0.1 to 99.9	0.1	1.0
	Welding current upper limit set value (%) **Note** Upper limit=Preset value + (Preset value x Adjustment value) Eg.)Preset value: 100 A, Adjustment value: 10 % ⇒ Upper limit = 110 A	**22**	WELD(A) UP-LIMIT	0 to 100	1	0

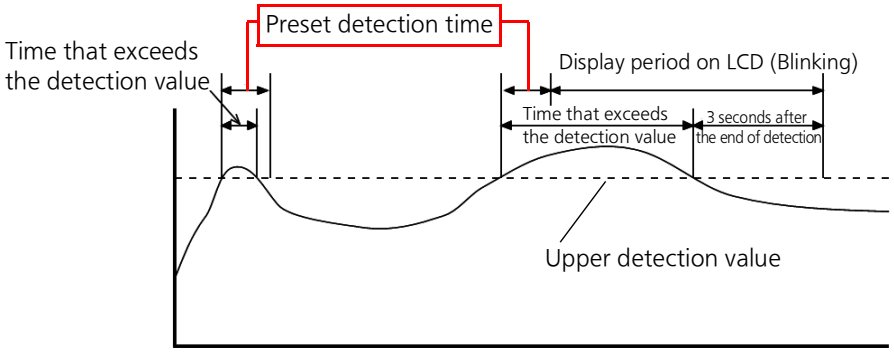
Contents		Sub-menu No.	LCD display (1st line)	Setting range	Increment	Default
Output management function						
Welding current upper/lower limit detection	Welding current lower limit detection set value (%) **Note** Lower limit=Preset value-(Preset value x Adjustment value) Eg.)Preset value: 100 A, Adjustment value: 10 % ⇒ Lower limit = 90 A	23	WELD(A) L-LIMIT	0 to 100	1	0
	Contact output at welding current upper/lower limit detection ON/OFF	24	WELD(A) DET CONTACT	0: OFF 1: ON	-	0
	Motion at welding current upper/lower limit detection	25	WELD(A) DET MOVE	0: Continue (Indication only) 1: Stop at the end of the current welding. Then press ENTER button to reset.	-	0
Welding voltage upper/lower limit detection	Welding voltage upper/lower limit detection ON/OFF	30	WELD(V) MONITOR	0: OFF 1: ON	-	0
	Welding voltage upper/lower limit detection time (s)	31	WELD(V) DETECT T	0.1 to 99.9	0.1	1.0
	Welding voltage upper limit detection set value (%) **Note** Upper limit=Preset value + (Preset value x Adjustment value) Eg.)Preset value:18.4 V, Adjustment value: 10 % ⇒ Upper limit: 20.2 V	32	WELD(V) UP-LIMIT	0 to 100	1	0
	Welding voltage lower limit detection set value (%) **Note** Lower limit=Preset value-(Preset value x Adjustment value) Eg.)Preset value: 18.4 V, Adjustment value: 10 % ⇒ Lower limit: 16.6 V	33	WELD(V) L-LIMIT	0 to 100	1	0

Contents		Sub-menu No.	LCD display (1st line)	Setting range	Increment	Default
Output management function						
Welding voltage upper/lower limit detection	Contact output at Welding voltage upper limit detection	34	WELD(V) DET CONTACT	0: OFF 1: ON	-	0
	Motion at Welding voltage upper limit detection	35	WELD(V) DET MOVE	0: Continue (Indication only) 1: Stop at the end of the current welding. Then press ENTER button to reset.	-	0

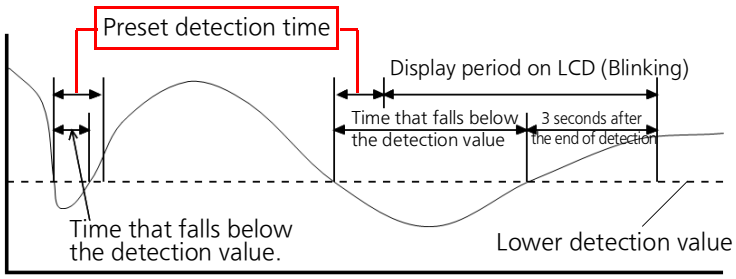
<Motion flow>

At motor current upper limit detection and welding current/voltage upper/lower limit detection

① It detects when current/voltage of each monitoring item goes beyond/below the detection value.



② After the end of detection time, LCD backlight blinks.
If the contact output is set to valid, the jig terminal contact closes. (See section "6.3.1 Jig terminals" on page 44.)



Welding counter	Counting the number of welding ON/OFF	40	WELD COUNTER	0: OFF 1: ON	-	0
	Check/reset welding counter	41	WELD COUNT CHECK	0: Check 1: Reset welding counter (The initial screen of MANAGEMENT setting dialog box is displayed.)	-	0
	Welding counter target value	42	TGT WELD COUNT	1 to 30 000	1	30 000

Contents		Sub-menu No.	LCD display (1st line)	Setting range	Increment	Default
Output management function						
Arc time	Accumulated arc time ON/OFF	50	ARC TIME INTEGR	0: OFF 1: ON	-	0
	Check/reset arc time accumulation • Accumulate up to 9 999 h 59 min 59 s. Arc time beyond that time won't be counted. The counter does not automatically reset to "0". • Select "1.Reset" to return to the initial screen of the MAN-AGEMENT group.	51	ARC-T INTEGR CHK	0: Check 1: Reset arc-time integrated value.	-	0
	Accumulated arc time target value (h)	52	TGT ARC-T INTEGR	1 to 9 999	1	9 999
Wire usage	Monitoring wire usage(*) ON/OFF	60	WIRE USAGE	0: OFF 1: ON	-	0
	Check/reset wire usage(*) **Note** • Count up to 999.9 kg of wire usage. Wire usage beyond that amount won't be counted. The counter won't be reset to zero (0) auto-matically. • Select "1.Reset" to return to the initial screen of the MAN-AGEMENT group.	61	WIRE USAGE CHECK	0: Check 1: Reset the wire usage	-	0
	Wire usage(*) target value (kg)	62	TGT WIRE USAGE	1 to 999	1	999

Contents		Sub-menu No.	LCD display (1st line)	Setting range	Increment	Default
Output management function						
Fan rotation time	Fan rotation time ON/OFF	70	FAN ROT-T	0: OFF 1: ON	-	0
	Check/reset fan rotation time **Note** • Count up to 9 999 h 59 min 59 s. Fan rotation time beyond that amount won't be counted. The counter won't be reset to zero (0) automatically. • Select "1.Reset" to return to the initial screen of the MANAGEMENT group.	71	FAN ROT-T CHECK	0: Check 1: Reset the fan rotation time	-	0
	Fan rotation time target time (h)	72	TARGET FAN ROT-T	1 to 9 999	1	9 999

(*): About wire usage:

- Wire usage is calculated based on wire diameter, wire feed amount (length) per minute, actual wire feed time and specific gravity of wire. As the specific gravity of wire varies with wire type, for example, solid wire and flux-cored wire have different specify gravity, which are 7.8 g/cm^3 and 6.5 g/cm^3 respectively, wire usage may vary with applied wire type.
- Wire usage is counted in inching operation but not counted in wire retract operation.

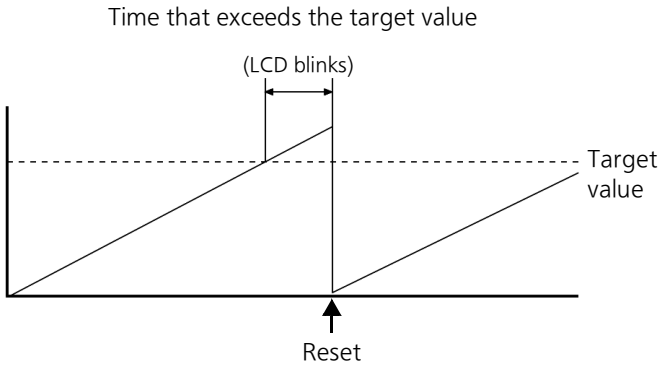
<Motion flow>

When the counter reaches the target value of Welding count, Arc time, wire usage, and fan rotation time

① Any one of the monitoring items exceeds the target value.

② LCD backlight blinks.

③ - Reset the monitoring item that has reached the target value to stop blinking.
- For welding count and accumulated arc time, press any button to stop blinking. (Use it as a target for workload)
- For wire usage and fan rotation time, pressing any button does not stop blinking backlight of LCD. It is to ensure a steady implementation of maintenance work.
- Make sure to reset the monitoring item that has reached the target value, otherwise, LCD backlight blinks the next time the item is counted.



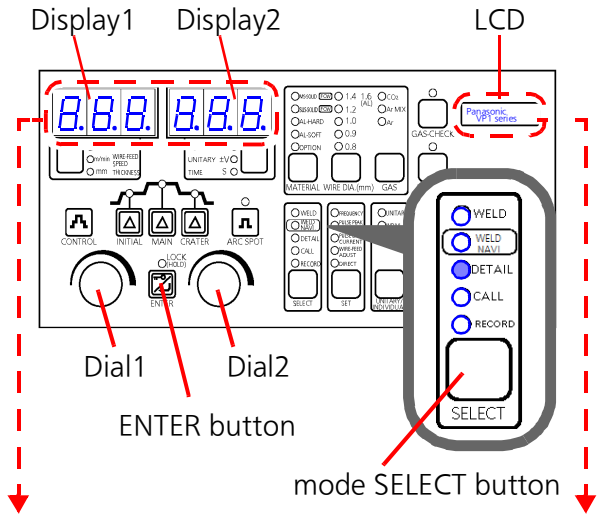
8.5.2 Setting procedure (MANAGEMENT function)

To quit the setting in the middle

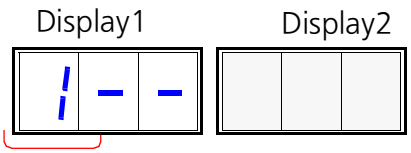
Press mode SELECT button to return to the beginning of the current Mode settings.

1. Select DETAIL mode.

Press mode SELECT button several times until LED for DETAIL is lit.



→ The far left column of Display1 indicates "1" for Group 1.



LCD

ADVANCED

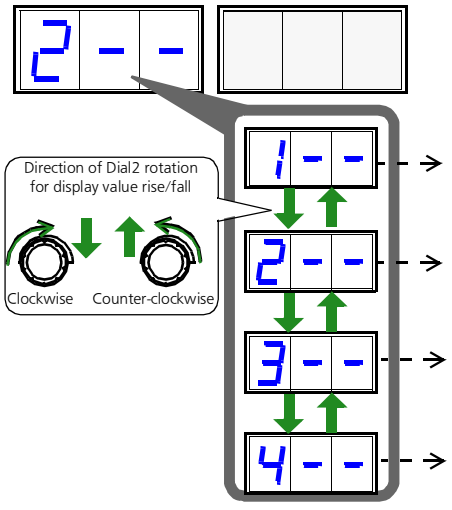
Contents of the group No. on Display1

2. Specify a DETAIL group.

Turn Dial1 until the desired group number (1 to 4) is displayed.

(Example: Select group 2.)

Press ENTER button.



MANAGEMENT

ADVANCED

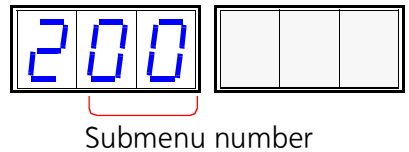
MANAGEMENT

SYSTEM

CUSTOMIZATION

→ Submenu No. "00" is indicated on Display1

→ Contents of the submenu 00 is indicated on the second line of LCD.



SUB-MONITOR

Contents of the submenu 00.

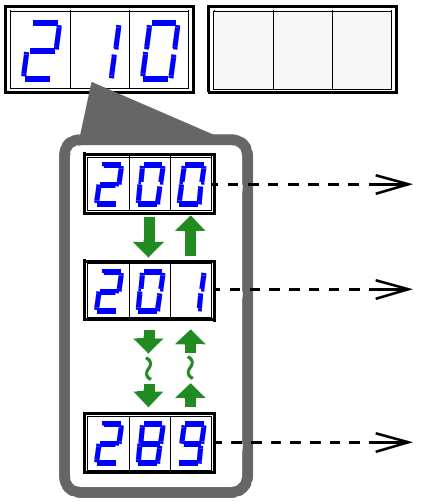
3 Specify a submenu.

Turn Dial1 until the desired submenu No. (00 to 89) is displayed.
* Check with submenu No. on Display1 and/or its contents on LCD.

* For menu Nos. not in use: Those menu numbers are indicated on Display1 with "---" on LCD as its contents. (See the example of submenus in the figure on the right. It is a unused submenu (no contents)

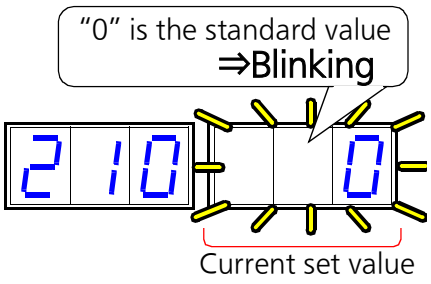
(Example: Specify submenu 10: MTR(A) MONITOR)

Press ENTER button.



→ The standard value is indicated on the second line of LCD.
* (Asterisk (*) on the right of the value indicates the value is the standard value.

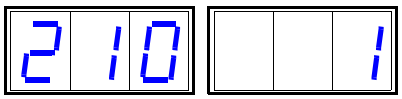
→ If the current set value is the standard value, the value on Display2 blinks. If not, the value lights solidly.



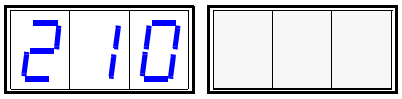
4. Change the set value of the submenu.

Turn Dial2 until the desired set value of the submenu is displayed on Display2.
(Example: Set "1".)

Press ENTER button.

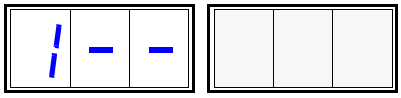
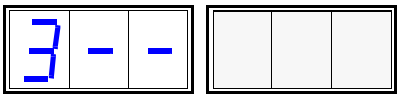
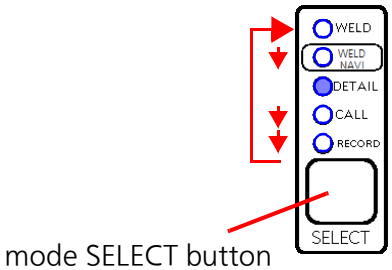


→ Display2 is cleared.
→ Display1 becomes selectable.

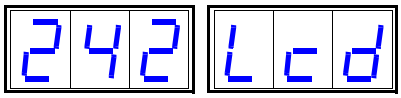
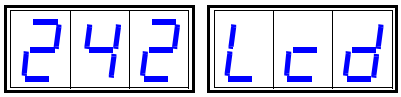
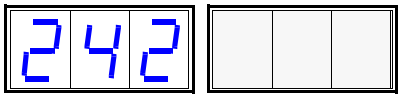


5. To edit other submenus of the mode.

Repeat the previous procedures 3 (Specify a submenu) and 4 (Change the set menu of the submenu) for each submenu you want to edit. (See section "8.5.1 Setting items" on page 95.)

6.	To exist from this group and edit another group of DETAIL mode:		
	Press mode SELECT button once.		ADVANCED
	Turn Dial1 until the desired group number (1 to 4) is displayed. (Example: Select group 3)		SYSTEM
7.	To exist from DETAIL mode:		
	Press mode SELECT button several times until LED for the desired mode is lit.		

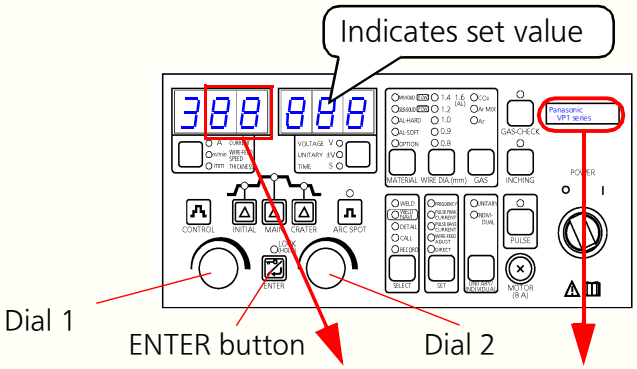
In the previous procedure “Change the set value of the submenu.”, if Display2 indicates “Lcd”.

(In DETAIL mode, select submenu 42.) The current set value is displayed in the second line of LCD not Display2.		TGT WELD COUNT *****
The new set value updated using Dial2 is displayed in the second line of LCD. (Example: Set the target value to “12345”.) Press ENTER button.		TGT WELD COUNT 12345
→ Display2 is cleared. → Display1 becomes selectable.		TGT WELD COUNT

8.6 Group3: SYSTEM settings

8.6.1 Setting items

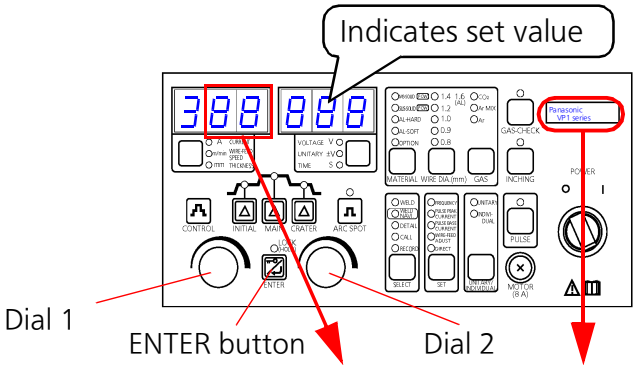
* Submenu numbers not in use are ignored.



Submenu number
- Use Dial1 to select.
- Press ENTER to set.

Set value
- Use Dial2 to select.
- Press ENTER to set.

Contents	Submenu#	LCD display (1st line)	Setting range	Increment	Default
Crater repeat ON/OFF	00	CRATER REP	0: OFF 1: ON	—	0
Leg length control ON/OFF (To keep the leg length constance regardless of change of wire extension.)	01	LEG LENGTH CTRL	0: OFF 1: ON	—	0
Wire extension (mm) (Except semi-auto welding, welding table is selected based on the wire extension.)	02	WIRE EXT. LENGTH	0: Semi-auto welding 1: 10 mm 2: 12 mm 3: 15 mm 4: 20 mm 5: 25 mm	—	0
Analog remote controller(*) With/Without	03	ANALOG RC	0: Without 1: With	—	1
CALL/RECORD function ON/OFF	04	PLY/REC USE SEL.	0: OFF 1: ON	—	1
Max. voltage for current/voltage preset value of remote controller set value (V)	05	INPUT VOLTAGE	0: 15 V 1: 12 V 2: 10 V	—	0
Output limit (A) (Setting the max. output current)	06	OUTPUT CONTROL	30 to 400	10	400
Energy saving (Specify a standby time for all LED to be turned off. (minute)	07	ENERGY SAVING	0 to 10	1	0
Guide LCD ON/OFF (Whether to turn OFF the backlight if there is no item to display on LCD.	08	GUIDE LCD CTRL.	0: ON (to turn off backlight) 1: OFF (Keep the backlight ON all the time.)	—	0
Start circuit With/Without	09	START CIRCUIT	0: Without 1: With	—	1
Output value correction: GAIN (%)	10	GAIN	80 to 120	1	100



Submenu number
- Use Dial1 to select.
- Press ENTER to set.

Set value
- Use Dial2 to select.
- Press ENTER to set.

Contents	Submenu#	LCD display (1st line)	Setting range	Increment	Default
Output value correction: OFFSET (A)	11	OFFSET	-20 to 20	1	0
Fill flow time (second)	12	FILL FLOW TIME	0 to 60	—	0
Current detection delay (ms)	13	CURR DET DELAY	0 to 300	1	50
IIF unit function (* Not applicable to this product.)	14	IIF FUC SEL	0: CH63+Retract 1: CH100	—	0
Time setting	15	DATE/TIME	-	—	—
Select language	16	LANGUAGE	0: ニホンゴ 1: English	—	1
Crater repeat expiration (second)	17	CRATER REP TIME	0.5 to 5.0	0.1	2.0
Reset items (Whether to reset welding parameters/memory channels (RECORD mode).	18	RESET	0: ADVANCED 1: DETAI+MEMORYCH 2: RETURN	—	—
(Not in use)	19	OPT. COND. UNIT	0: OFF 1: ON	—	0
Specify voltage detection method	20	VOLT. DETECT	0: Normal TERM 1: External TERM	—	0

(*): When the digital remote controller is connected, set to “0: Without”.

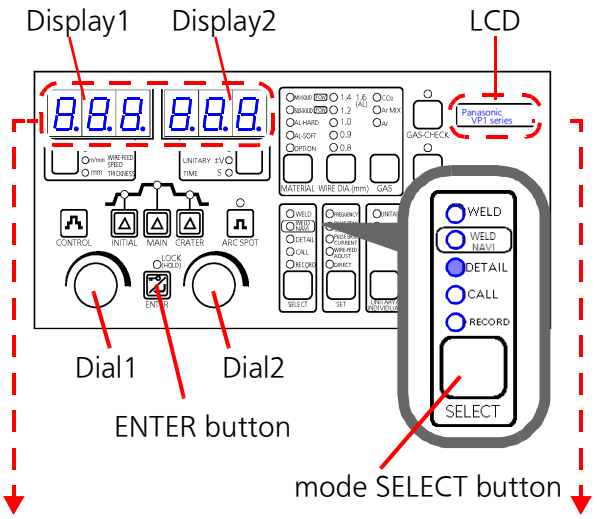
8.6.2 Setting procedure (System settings)

To quit the setting in the middle

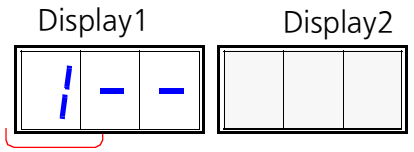
Press mode SELECT button to return to the beginning of the current Mode settings.

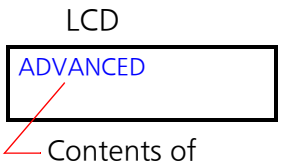
1. Select DETAIL mode.

Press mode SELECT button several times until LED for DETAIL is lit.



→ The far left column of Display1 indicates "1" for Group 1.



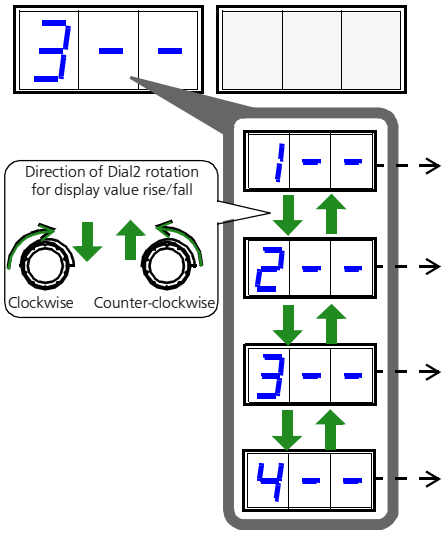


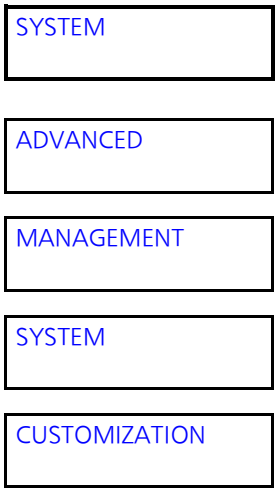
2. Specify a DETAIL group.

Turn Dial1 until the desired group number (1 to 4) is displayed.

(Example: Select group 3.)

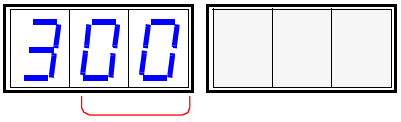
Press ENTER button.





→ Submenu No. "00" is indicated on Display1

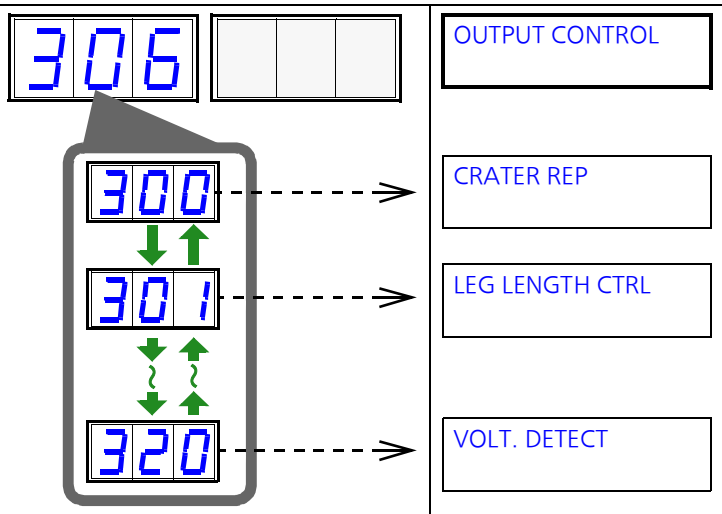
→ Contents of the submenu 00 is indicated on the second line of LCD.



3 Specify a submenu.

Turn Dial1 until the desired submenu No. (00 to 20) is displayed.
* Check with submenu No. on Display1 and/or its contents on LCD.
* For menu Nos. not in use: Those menu numbers are indicated on Display1 with "- - - - -" on LCD as they have no contents.

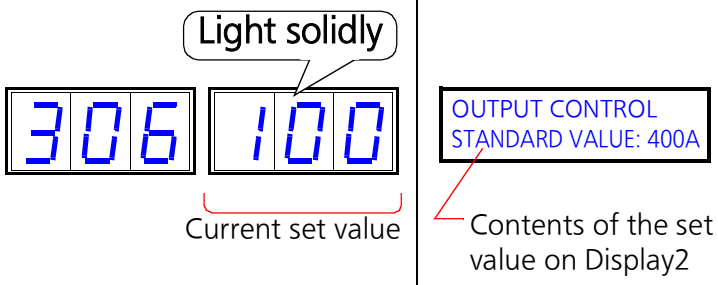
Press ENTER button.



→ The standard value is indicated on the second line of LCD.

→ If the current set value is the standard value, the value on Display1 blinks. If not, the value lights solidly.

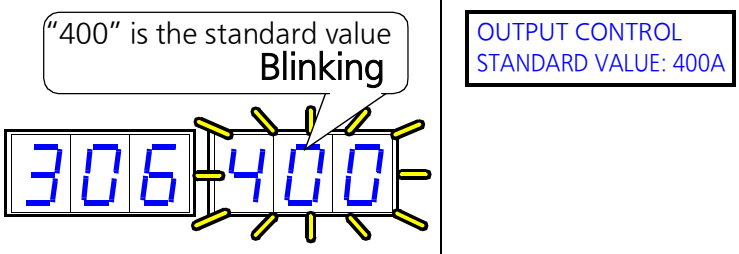
(Example: If the current set value is "400", the value on Display2 blinks. Because it is not the standard value, the value lights solidly.



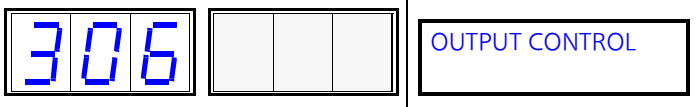
4. Change the set value of the submenu.

Turn Dial2 until the desired set value of the submenu is displayed on Display2.
(Example: Set "400".)

Press ENTER button.

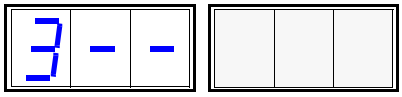
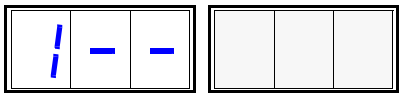
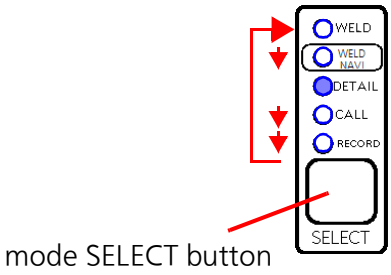


→ Display2 is cleared.
→ Display1 becomes selectable.



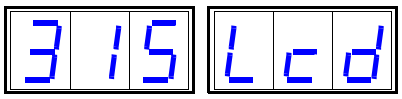
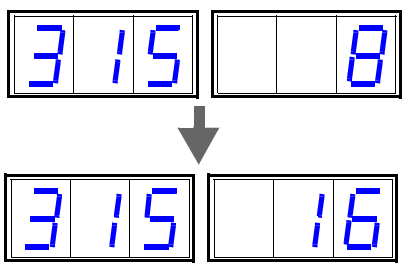
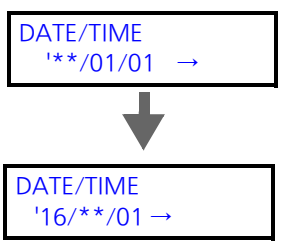
5. To edit other submenus of the mode.

Repeat the previous procedures 3 (Specify a submenu) and 4 (Change the set value of the submenu) for each submenu you want to edit. (See section "8.6.1 Setting items" on page 104.)

6.	To exist from this group and edit another group of DETAIL mode:		
	Press mode SELECT button once.		SYSTEM
	Turn Dial1 until the desired group number (1 to 4) is displayed. (Example: Select group1.)		ADVANCED
7.	To exit from DETAIL mode:		
	Press mode SELECT button until LED for the desired mode is lit.		

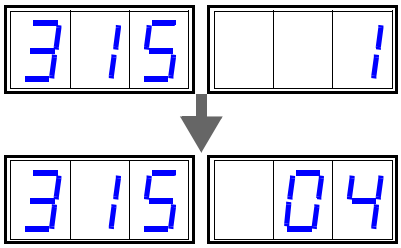
About submenu "5.DATE/TIME"

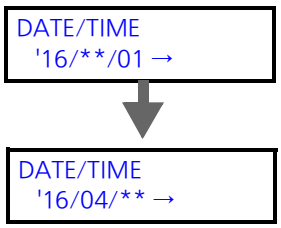
- When an error occurs, the corresponding error number and time of error occurrence are recorded as "error log" based on the time set by this setting item.
- The time is factory set to "'00/1/1" representing January 1st, 2000 at shipment.
- Use this setting to record actual date and time of error occurrence.
- The product has a rechargeable battery for time data memory.
- Turning on power at the product recharges the battery.
- With brand-new battery, it takes about five minutes to charge, and the fully charged battery lasts about one month.
- Accuracy of the clock is about ±30 s/month. Re-set the clock as needed.

Turn Dial2 until submenu15 (DATE/TIME) is displayed, and press ENTER button. → Display2 indicates "Lcd". → LCD indicates DATE/TIME based on the current setting. Press ENTER button.		
(1) Set "Year"		
→ Display2 indicates "year" based on the current setting. → "Year" indication on LCD is changed to "**". • Turn Dial2 to set the last two digits of a year, and press ENTER button. (Example: Set "16".)		

(2) Set “Month”

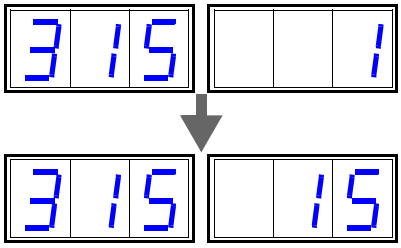
- Turn Dial2 clockwise to a graduation position.
- Press ENTER button.
  → Display2 indicates “month” based on the current setting.
  → ”Month” indication on LCD is changed to “**”.
- Turn Dial2 to set the month, and press ENTER button. (Example: Set to “04”.)

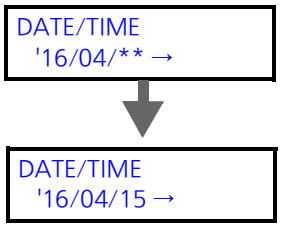




(3) Set “Day”

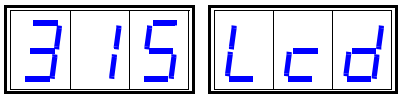
- Turn Dial2 clockwise to a graduation position.
- Press ENTER button.
  * To set only “day”, i.e., skip “year” and “month” settings, turn Dial2 to two-graduation position, and press ENTER button.
  → Display2 indicate “day” based on the current setting.
  → ”Day” indication on LCD is changed to “**”.
- Turn Dial2 to set the day, and press ENTER button. (Example: Set to “15”.)

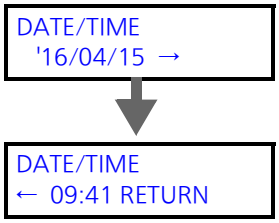




(4) Display “time”

- Turn Dial2 clockwise to a graduation position.
- Press ENTER button.
  * To set only “time”, i.e., skip “DATE” settings, turn Dial2 to three-graduation position, and press ENTER button.
  → Display2 indicates the preset “year”.
- Press ENTER button.

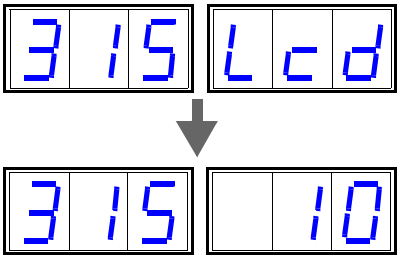


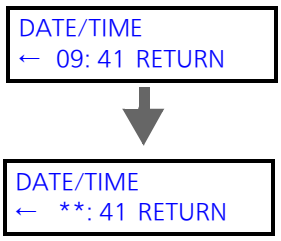


(5) Set “hour”.

→ “Hour” indication on LCD is changed to “**”.

- Turn Dial2 to set the hour, and press ENTER button. (Example: Set to “10”.)

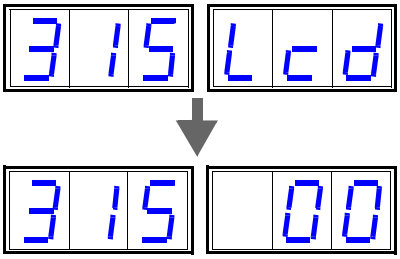


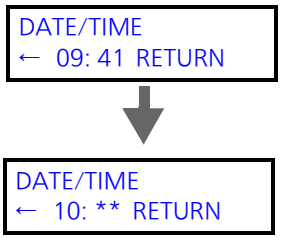


(6) Set “minute”.

- Turn Dial2 clockwise to a graduation position.
- Press ENTER button.
  → Display2 indicates “time” based on the current setting.
  → “Minute” indication on LCD is changed to “**”.
- Turn Dial2 to set the minute, and press ENTER button. (Example: Set to “00”.)

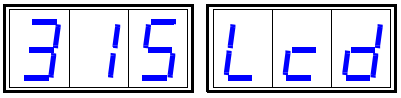
→ Return to “Select a submenu” procedure.





(7) To cancel “Time setting”

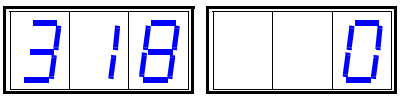
- Turn Dial2 clockwise to five-graduation position, and press ENTER button.



About submenu "18.RESET"

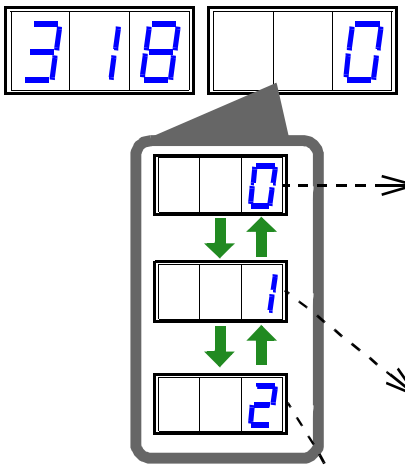
Turn Dial2 until submenu 18 (RESET) is displayed, and press ENTER button.

→ Display2 indicates current set value.



RESET

Turn Dial2 to specify reset items from 0 to 2, and press ENTER button.



RESET

RESET
0: ADVANCED

RESET
0: INITIALIZATION

RESET
1: DETAI+MEMORYCH

RESET
0: INITIALIZATION

RESET
2: RETURN

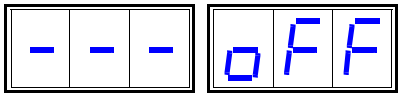
If you select "0" or "1":
You need to choose whether to reset the item (0: INITIALIZATION) or
to cancel the reset (1: RETURN).

If you select "2",
Return to "Select a submenu" procedure.

Note
"ADVANCED" =DETAIL mode
"MEMORYCH"=RECORD mode

Select "0: Advanced" or "1: DETAI+MEMORYCH", and

Select "0: INITIALIZATION":
"POWER OFF" is displayed on LCD.
Turn the breaker off to start initialization of the selected item, i.e."0" for welding parameters or "1" for welding parameters and memory channels (RECORD mode).



POWER OFF

Select "1: RETURN":
Return to "Select a submenu" procedure.

8.6.3 About FILL FLOW function (Group 3 and submenu 12)

⚠ WARNING

- Provide sufficient ventilation or wear breathing equipment. Toxic fumes and gases generated during welding can be hazardous.
- Fill flow function enables continuous gas supply.

1) Outline

It enables to operate the gas solenoid valve of the wire feeder for a preset period of time, not while torch switch is in ON state.

2) Advantages

- It fills the shield gas near the weld start point (for groove welding etc.)
- It stabilizes the mixed state of the shield gas.
- It can drain air from the torch.

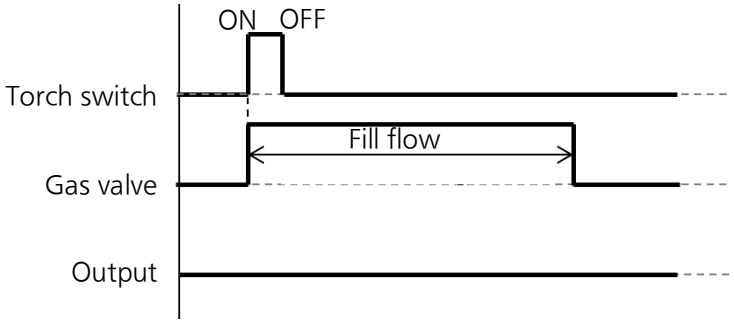
3) Settings

The fill flow time can be changed. For details, see section "8.6 Group3: SYSTEM settings" on page 104.

4) Operation

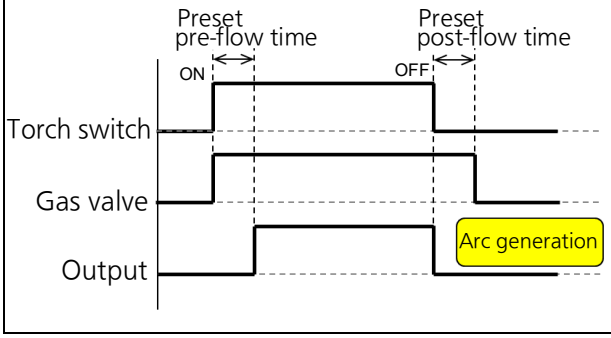
① Use fill flow alone

Turn ON-and-OFF the torch switch at a quicker pace than pre-flow time.

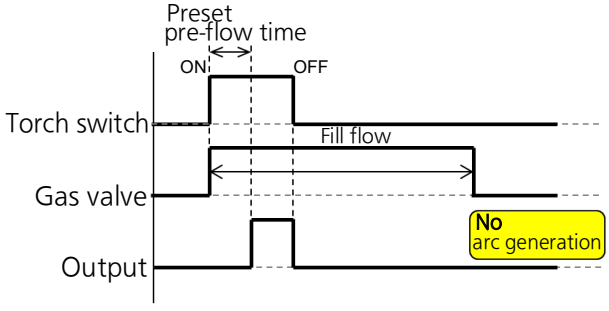


<Note> The following shows sequences when the ON-and-OFF of the torch switch takes longer than the preset pre-flow time. The sequence varies with arc generation (generates or not).

<No fill flow - standard welding sequence>



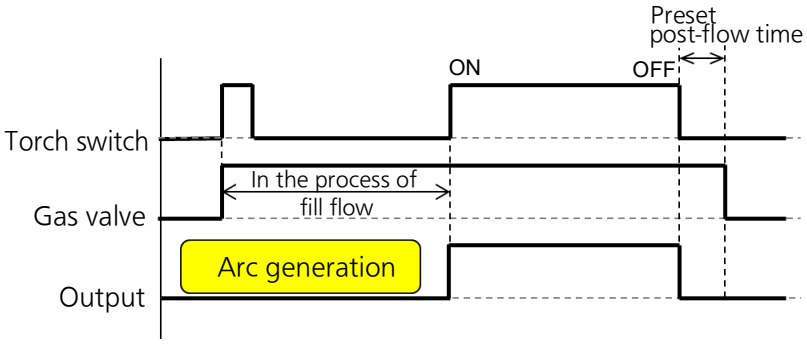
<Fill flow alone>



5) Operation

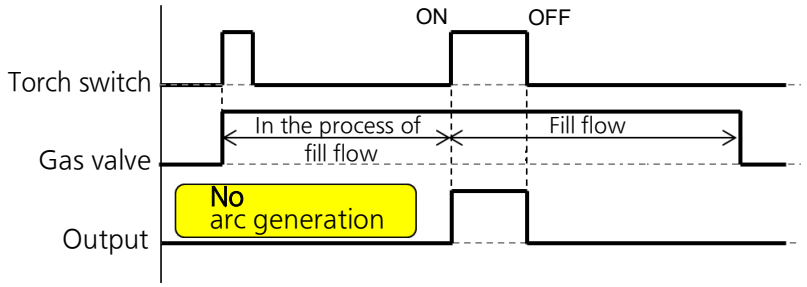
② Start welding in the process of fill flow.

- If the torch switch is turned on in the process of fill flow, the welding operation starts with no pre-flow.



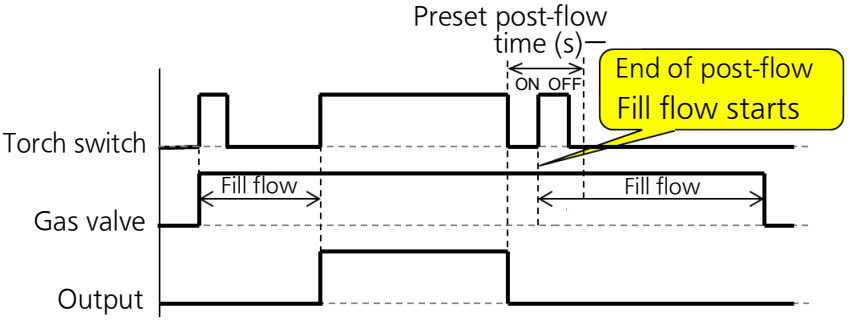
③ Extend fill flow time in the process of fill flow.

- It is possible to extend the fill flow time by turning ON-and-OFF the torch switch quickly not to generate arc.



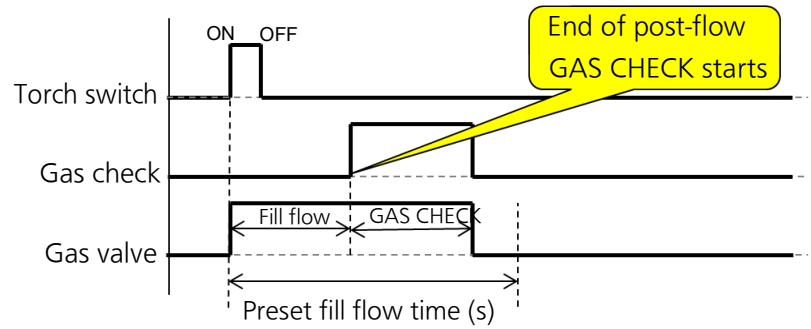
④ Interrupt the post-flow process to fill flow

- It is possible to change from post-flow to fill flow during post-flow process by turning ON-and-OFF the torch switch quickly.



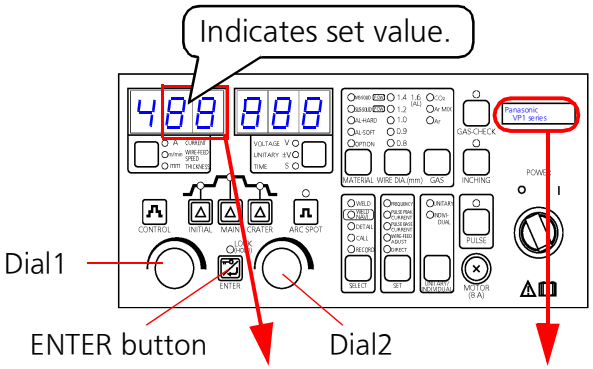
⑤ Quit fill flow process in the middle

- Press GAS CHECK button in the middle of fill flow process to quit fill flow and start GAS check.
- Press GAS CHECK button once again to stop the GAS CHECK.



8.7 Group 4: CUSTOMIZATION settings

8.7.1 Setting items



Submenu No.
- Use Dial1 to select.
- Press ENTER to set.

Set value
- Use Dial2 to select.
- Press ENTER to set.

Contents	Submenu #	LCD display (1st line)	Setting range	Increment	Default
Welding speed in THICKNESS settings (Welding speed set value when welding conditions are automatically set using THINK-NESS settings) See section "8.1 Setting THICKNESS" on page 74.	00	WELDING SPEED	0.2 to 1.0	0.1	0.3

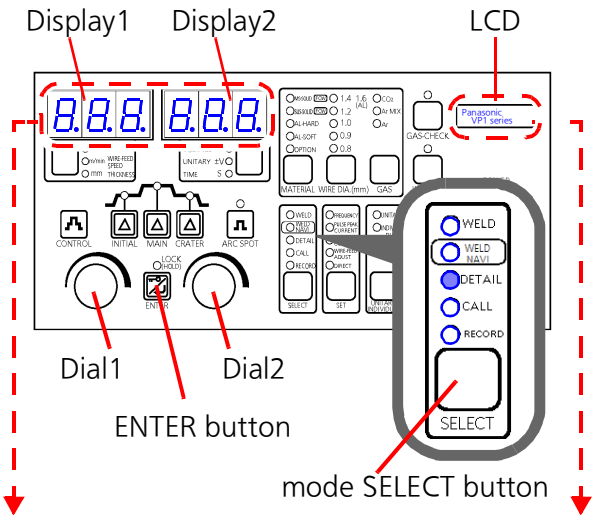
8.7.2 Setting procedure (Customization setting)

To quit the setting in the middle

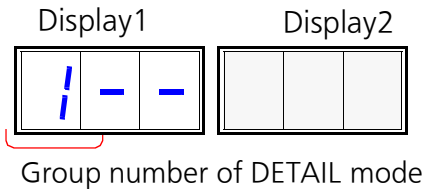
Press mode SELECT button to return to the beginning of the current Mode settings.

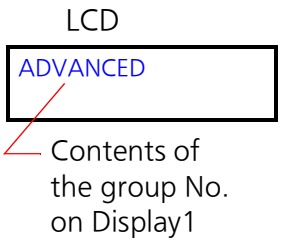
1. Select DETAIL mode.

Press mode SELECT button several times until LED for DETAIL is lit.



→ The far left column of Display1 indicates "1" for Group 1.



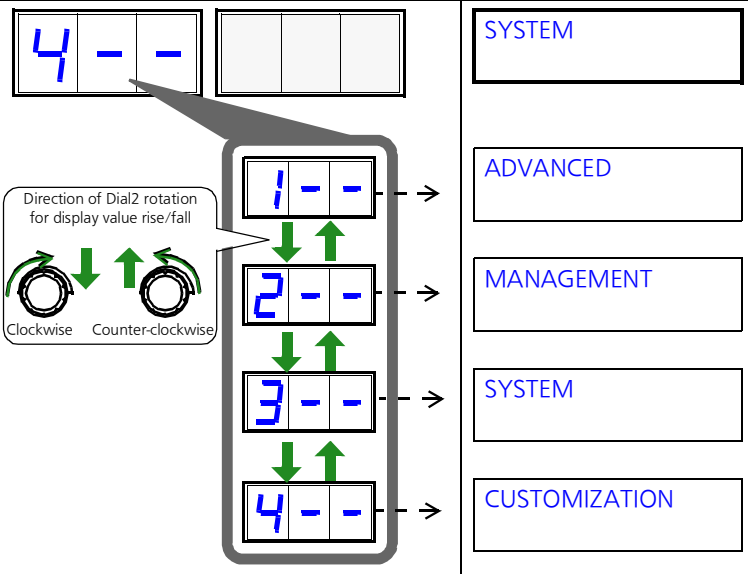


2. Specify a DETAIL group.

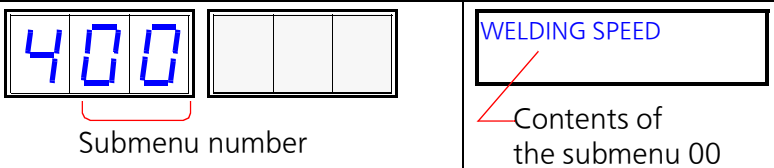
Turn Dial1 until the desired group number (1 to 4) is displayed.

(Example: Select group 4.)

Press ENTER button.

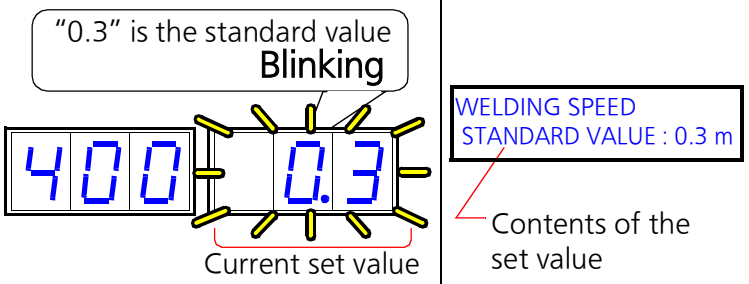


→ Submenu No. "00" is indicated on Display1.
→ Contents of the submenu 00 is indicated on the second line of LCD.



3 Specify a submenu.

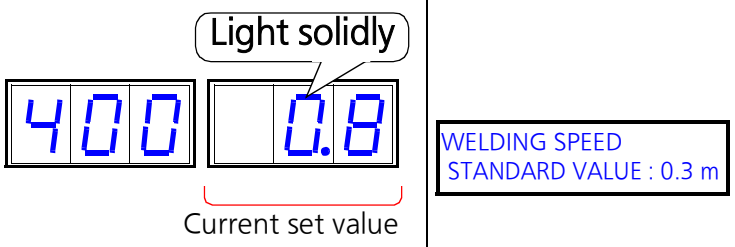
→ The current set value is indicated on Display2.
* If the current set value is the standard value, the value on Display2 blinks. If not, the value lights solidly.
(Example: the current set value in the figure on the right is "0.3" which is the standard value, therefore the value blinks.)



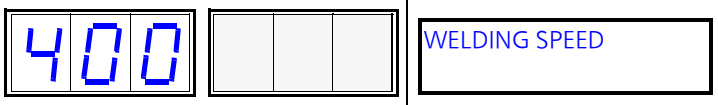
4. Change the set value of the submenu.

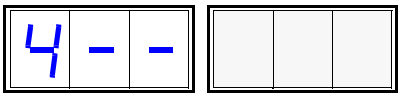
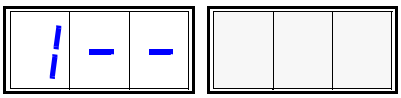
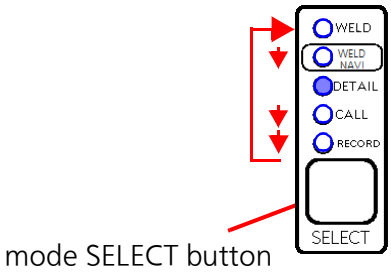
Turn Dial2 until the desired set value of the submenu is displayed on Display2.
(Example: Set "0.8".)

Press ENTER button.



→ DIsplay2 is cleared.
→ Display1 becomes selectable.



5.	To edit other submenus of the mode:		
	Repeat the previous procedures 3 (Specify a submenu) and 4 (Change the set value of the sub-menu) for each submenu you want to edit. (See section “8.7.1 Setting items” on page 114.)		
6.	To exit from this group and edit another group of DETAIL mode:		
	Press mode SELECT button once.		CUSTOMIZATION
	Turn Dial1 until the desired group number (1 to 4) is displayed. (Example: Select group1.)		ADVANCED
7.	To exit from DETAIL mode:		
	Press mode SELECT button until LED for the desired mode is lit.		

8.8 RECORD

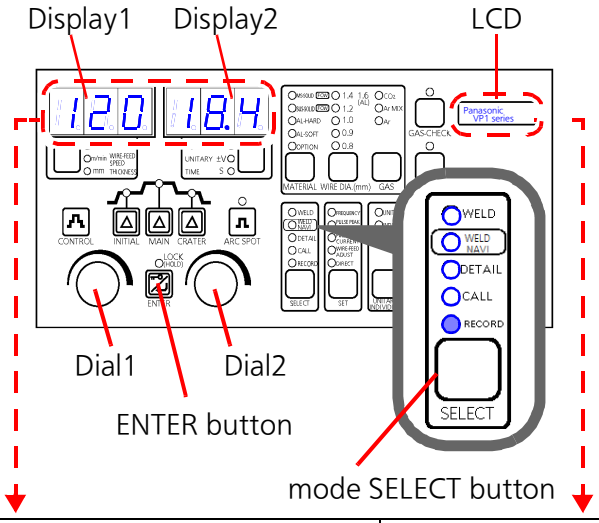
A function to store the specified welding conditions to the memory (CH1-CH100). Welding condition that have been stored scan be used by retrieving the data using CALL function.

To quit the setting in the middle

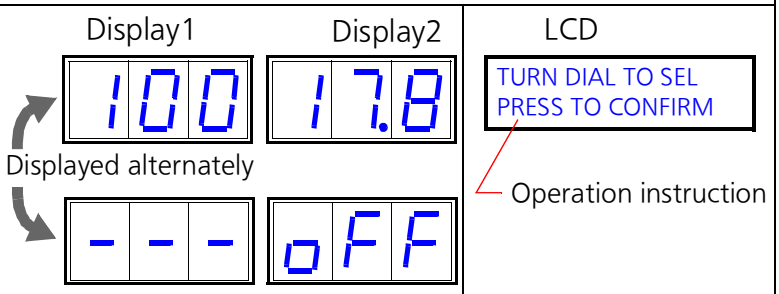
Press mode SELECT button to return to the beginning of the current Mode settings.

1. Select RECORD mode.

Press mode SELECT button several times until LED for RECORD is lit.

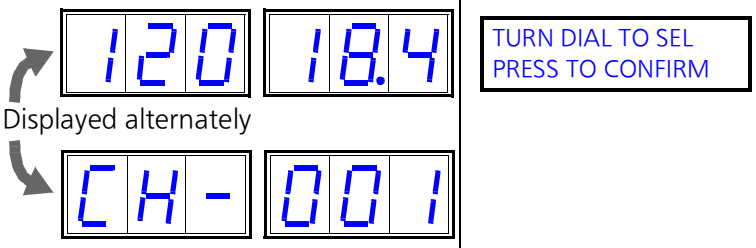


→ "Current set value/voltage set value" and "'- - -'/'oFF'" are indicated on Displays 1/2 alternately.



Turn Dial2 until the channel number (CH) you want to store the welding conditions to is displayed.

→ "Current set value/voltage set value" and "'CH-'/'(channel number)'" are indicated on Displays 1/2 alternately.
(Example: Store in CH-001.)



Press ENTER button.

(* At this moment, the data has not stored yet.)

→ Confirm to store.

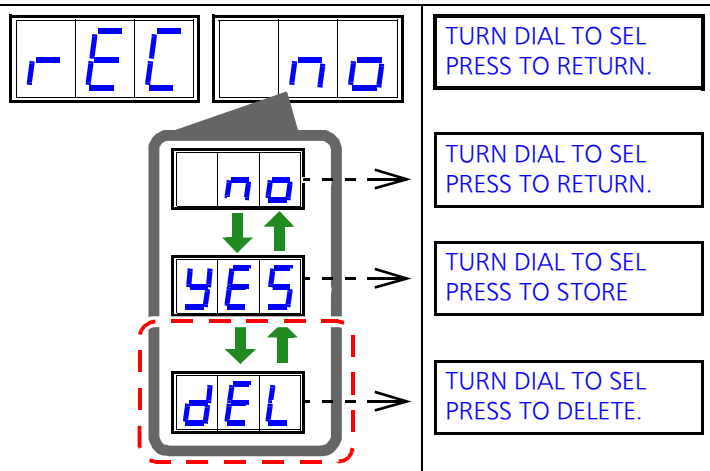
Turn Dial2 to specify the next action from below.

- **no**: to cancel the RECORD process and return to WELD mode.
- **yES**: To continue RECORD process (i.e., store the welding conditions to the selected channel No.).
- **dEL**: To delete the selected channel No. and return to WELD mode.

Note

"dEL" is selectable only an existing CH No. is selected.

Press ENTER button.

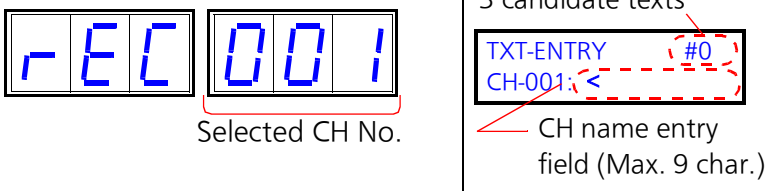


2. When "yES" is selected:

→ Display2 indicates the selected CH No.

→ 3 texts "# 0" are indicated on the far right of the first line on LCD.

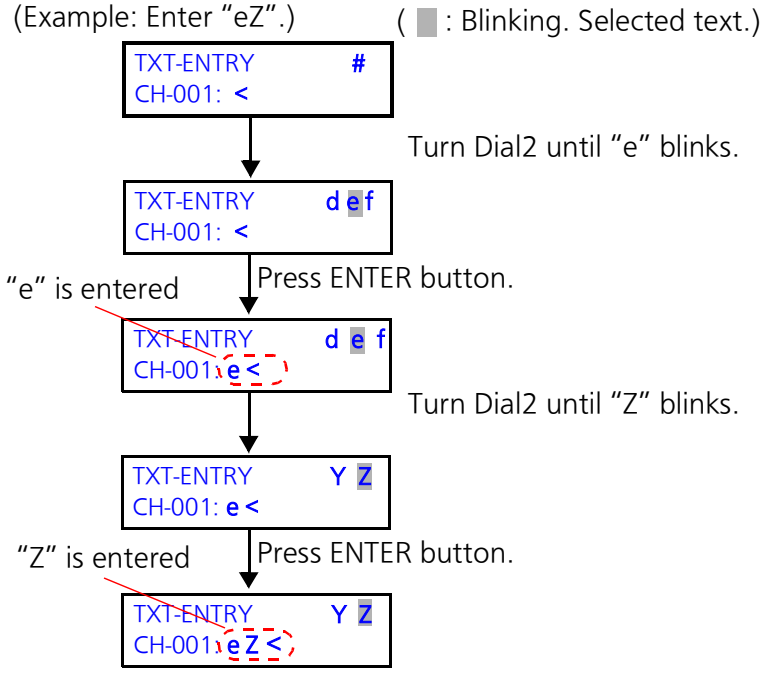
Enter a CH name (max. 9 texts).



<Enter texts>
Turn Dial2 clockwise to a graduation position to display a new text on the far right of the 1st line on LCD.

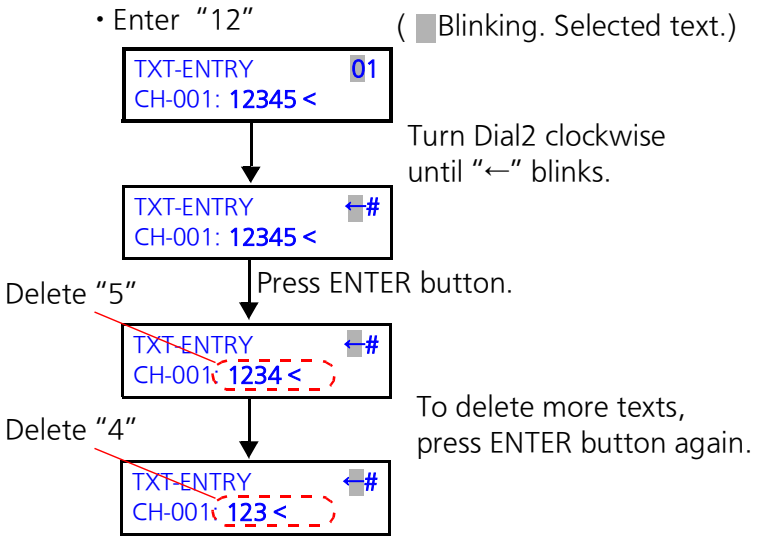
Order of char.: "#, numbers, alphabets (upper-case), alphabets (lower-case), symbols, ←, # "

- Up to three candidate texts are displayed on the upper right of LCD. Every time a new text is added to the far right, the text on the far left is deleted.
- The blinking text is the selected text.
- Press ENTER button to display the selected (blinking) text in the second line of LCD.
- Then repeat the procedure from turning Dial2 to enter texts.



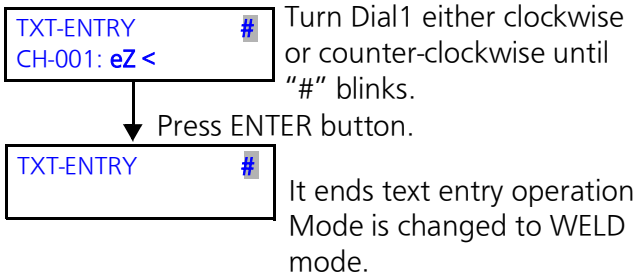
<Delete text>
Turn Dial2 clockwise to display " ← " on LCD.
* " ← " is the second to last character.

- Place the " ← " to blinking position and press ENTER button to delete the far right text in the second line.



3. How to complete "RECORD" operation

- Select the text " # " and press ENTER button to exit from "Enter text" operation and change to WELD mode.
- Or press ENTER button to enter the 9th letter to automatically exit from "ENTER text" operation and change to WELD mode.



8.9 CALL

A function to call welding conditions stored in the memory (CH1-CH100) and use.

Note

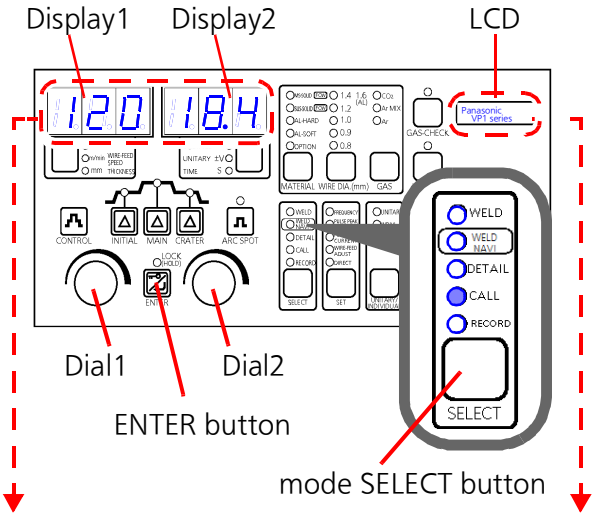
- When CALL is used while welding, it only calls current and voltage preset values.
- Operation varies with whether to use the remote controller or not.

To quit the setting in the middle

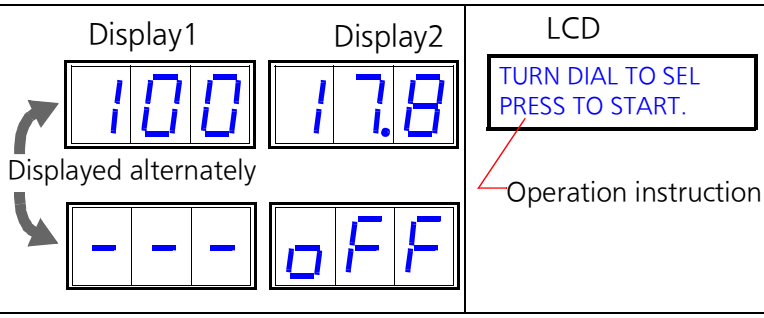
Press mode SELECT button to return to the beginning of the current Mode settings.

1. Select CALL mode.

Press mode SELECT button several times until LED for CALL is lit.



→ "Current set value/voltage set value" and "'- - -'/'oFF'" are indicated on Displays1/2 alternately.

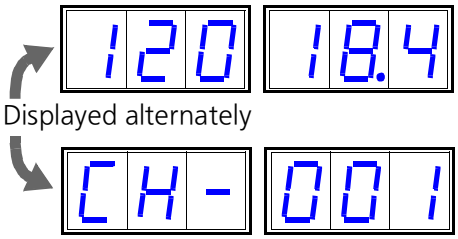


2. Set a channel number to CALL.

∗ **When the remote controller is used:**

Turn Dial2 to select a channel number (CH No.) to call.

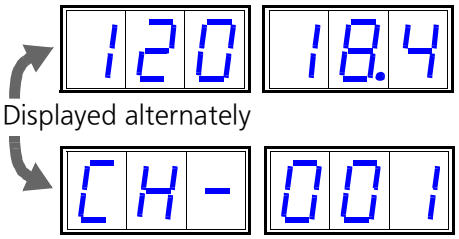
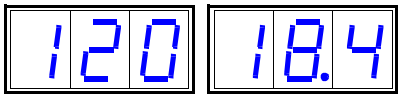
→ "Current set value/voltage set value" and "'CH'/'(channel number)'" are indicated on Displays1/2 alternately. (Example: CALL CH-001)



With remote controller

→ Welding operation becomes available.

* It is possible to change the channel to CALL by turning Dial2 while welding.

∗ **When remote controller is not used.** Turn Dial2 to select a channel number (CH No.) to call. → "Current set value/voltage set value" and "'CH'/'(channel number)'" are indicated on Displays1/2 alternately. (Example: CALL CH-001) Press ENTER button.		Without remote control TURN DIAL TO SEL PRESS TO START.
→ Call the contents of the selected CH No. → Displays1/2 indicate current set value/voltage set value respectively. → LCD display is cleared. → Welding operation becomes available.		

8.10 PULSE FREQUENCY, PULSE PEAK/BASE CURRENTS, WIRE-FEED ADJUST & DIRECT

Functions to quickly change parameters including while welding.

8.10.1 PULSE FREQUENCY

It fine-tunes the pulse frequency in pulse welding.

* It is the same setting contents as Submenu 14 of the GROUP 1 in DETAIL mode. See section "8.4.1 Setting items" on page 82.

Note

"Pulse frequency" is not adjustable if the material is set to "AL-HARD (hard aluminum)" or "AL-SOFT (soft aluminum)".

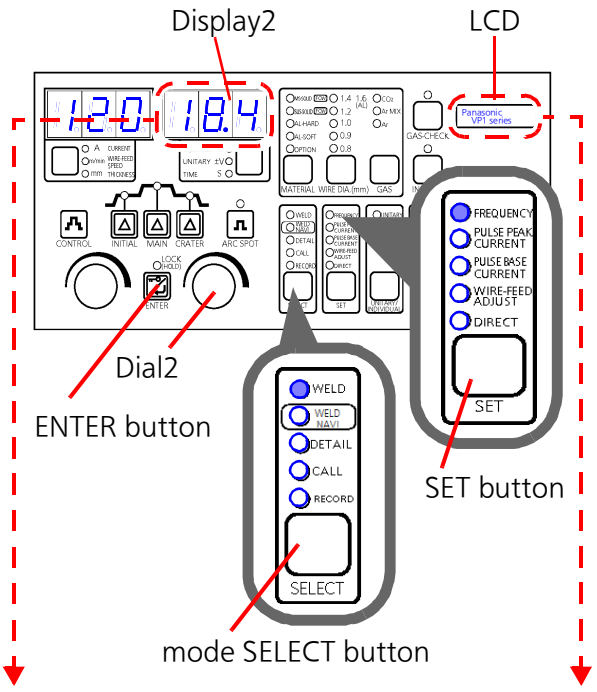
Adjust the pulse frequency in the following manner if needed. Do not change the pulse frequency significantly, otherwise, it can cause spatter generation and wire burning.

- To increase the frequency, reduce the pulse peak current or pulse base current.
- To reduce the frequency, increase the pulse peak current or pulse base current.

1. Select WELD mode.

   Press mode SELECT button several times until LED for WELD is lit.

   * SET button is enabled only in WELD mode.



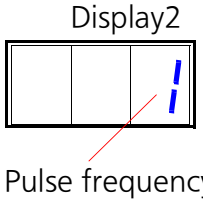
2. Select PULSE FREQUENCY.

   Press SET button a few times until LED for PULSE FREQUENCY is lit.

3. Fine-tune the pulse frequency.

   Use Dial2 to adjust.

   → Display2 indicates the pulse frequency set value. (Display1 indicates the current set value.)



4. Press ENTER button.

8.10.2 PULSE PEAK CURRENT

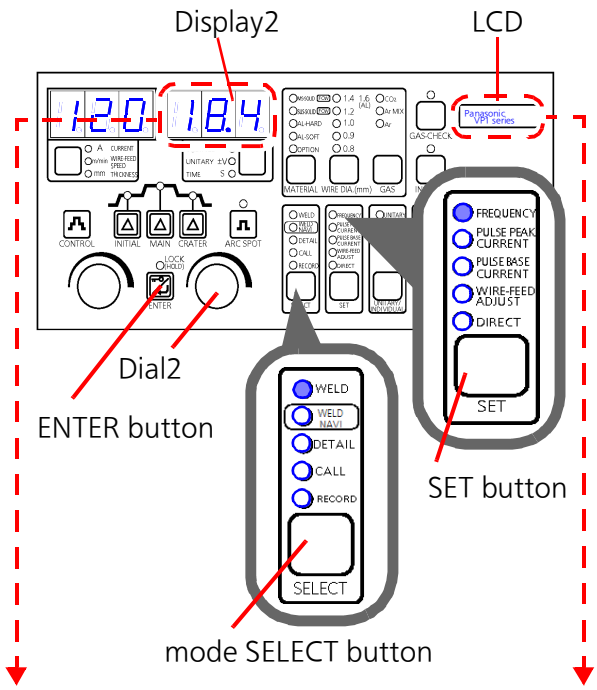
It fine-tunes the pulse peak current in pulse welding.

* It is the same setting contents as Submenu 07 of the GROUP 1 in DETAIL mode. See section "8.4.1 Setting items" on page 82.

1. Select WELD mode.

Press mode SELECT button several times until LED for WELD is lit.

* SET button is enabled only in WELD mode.



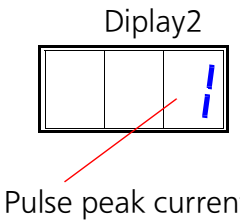
2 Select PULSE PEAK CURRENT.

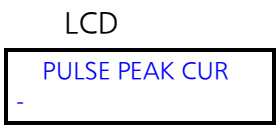
Press SET button a few times until LED for PULSE PEAK CURRENT is lit.

3 Fine-tune the pulse peak current.

Use Dial2 to adjust.

→ Display2 indicates the pulse peak current set value. (Display1 indicates the current set value.)





4 Press ENTER button.

8.10.3 PULSE BASE CURRENT

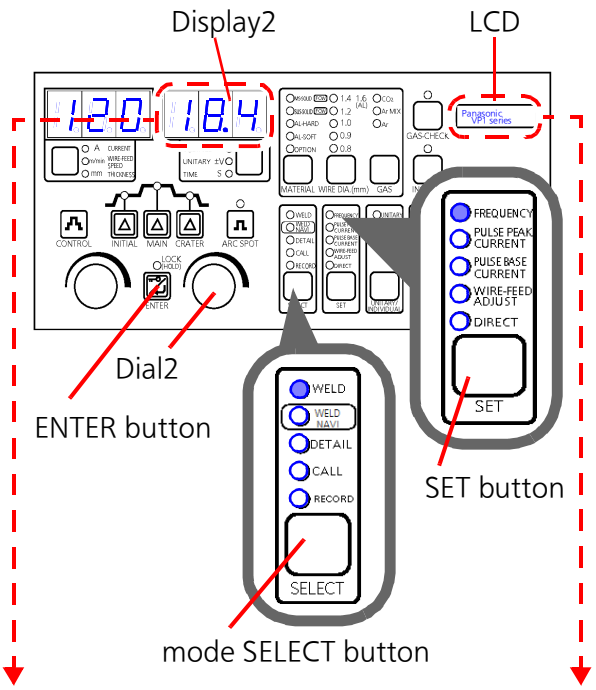
It fine-tunes the pulse base current in pulse welding.

* It is the same setting contents as Submenu 08 of the GROUP 1 in DETAIL mode. See section "8.4.1 Setting items" on page 82.

1. Select WELD mode.

Press mode SELECT button several times until LED for WELD is lit.

* SET button is enabled only in WELD mode.



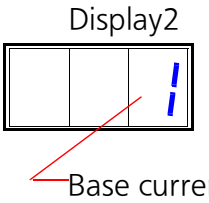
2 Select PULSE BASE CURRENT.

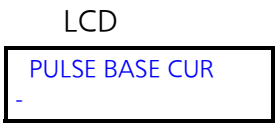
Press SET button a few times until LED for PULSE BASE CURRENT is lit.

3 Fine-tune the pulse base current.

Use Dial2 to adjust.

→ Display2 indicates the pulse base current set value. (Display1 indicates the current set value.)





4 Press ENTER button.

8.10.4 WIRE-FEED ADJUST

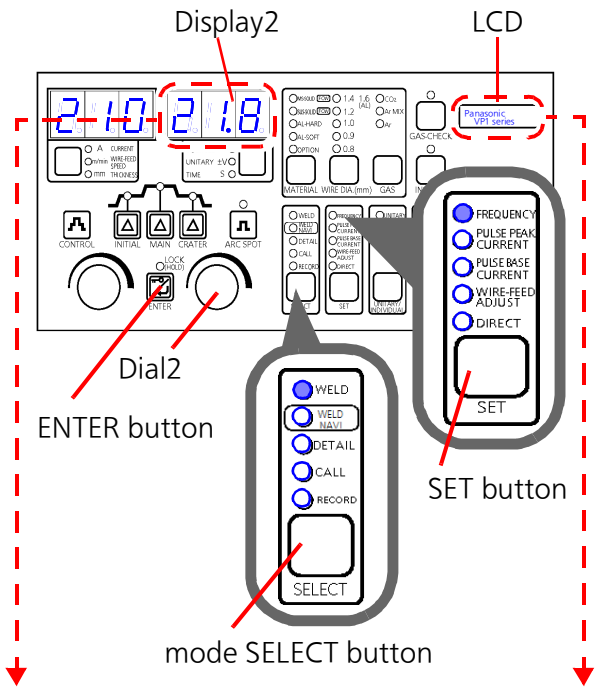
A function to fine-tune the wire feed speed without changing current waveform.

* It is the same setting contents as Submenu 11 in DETAIL group. See section "8.4.1 Setting items" on page 82.

1. select WELD mode.

Press mode SELECT button several times until LED for WELD is lit.

*SET button is enable only in WELD mode.



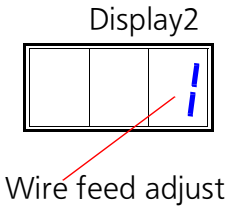
2 Select WIRE-FEED ADJUST.

Press SET button a few times until LED for WIRE-FEED ADJUST is lit.

3 Fine-tune the set value.

Use Dial2 to adjust.

→ Display2 indicates the wire-feed adjust set value. (Display1 indicates current set value.)



4 Press ENTER button.

8.10.5 DIRECT

A function that allows you to perform simple settings by allocating specific setting items, such as frequently used setting items, to its submenus.

Setting items that can be allocated to DIRECT
(* Submenu numbers no in use are ignored.)

	Submenu #	Setting item	Setting range	Increment	Default
DETAIL mode "Weld parameter"	0	RUN-IN SPEED	-50 to 50	1	0
	1	HOT VOLTAGE	-50 to 50	1	0
	2	FTT LEVEL	-99 to 99	1	0
	3	BURNBACK TIME	-99 to 99	1	0
	4	PENETRATION	-30 to 30	1	0
	5	PRE-FLOW TIME	0.0 to 10.0	0.1	0.2
	6	POST-FLOW TIME	0.0 to 10.0	0.1	0.5
	7	PULSE PEAK CUR	-99 to 99	1	0
	8	PULSE BASE CUR	-99 to 99	1	0
	9	PULSE RISE CUR	-30 to 30	1	0
	10	PULSE FALL CUR	-30 to 30	1	0
	11	WFS FINE ADJ(*1)	-50 to 50	1	0
	13	WAVE CONTROL 1	-99 to 99	1	0
	14	PULSE FREQ(*2)	-99 to 99	1	0
	17	PULSE WIDTH	-99 to 99	1	0
	18	CRATER DC	0: Invalid 1: Valid	-	0
	19	INIT PLS DC	0: Invalid 1: Valid	-	0
	20	LOW PULSE SET	0: Invalid 1: Valid 2: Automatic (*3)	-	0
	21	LOW PULSE CUR	30 to 400	2	120
	22	LOW PULSE VOL	5 to 50	0.2	20.2
	23	LOW PULSE FREQ	0.5 to 10	0.1	2.0
	24	LOW PULSE DUTY	10 to 90	5	50
	25	LOW PULSE DELAY	0 to 9.9	0.1	0
	30	DISPLAY TIME	1 to 30	1	5
	32	PENET INC	0: Invalid 1: Valid 2: Automatic	-	2

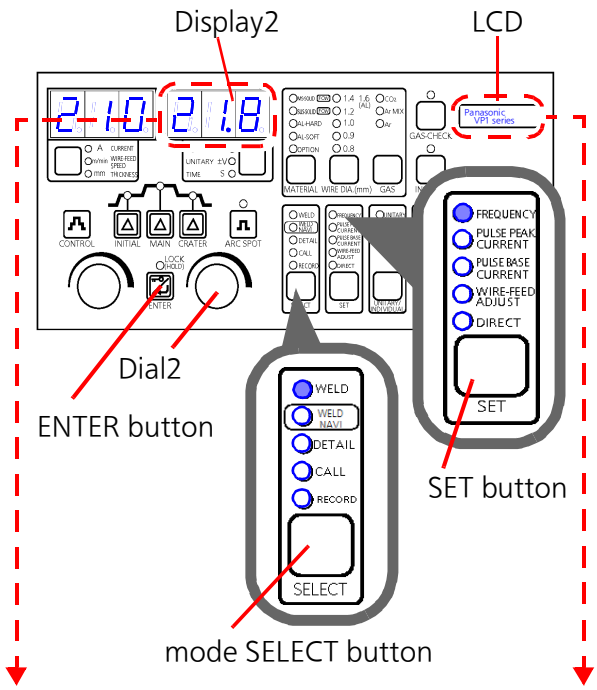
(*1)The same setting item as "WIRE-FEED ADJUST" in SET button.
(*2)Not adjustable if material is set to either "AL-HARD (Hard aluminum)" or "AL-SOFT (Soft aluminum)".
(*3)Not adjustable if "2: AUtomatic" is selected " as "LOW PULSE DELAY" in this setting becomes "0".

How to allocate setting items

1. Select WELD mode.

Turn mode SELECT button several times until LED for WELD is lit.

*SET button is enabled only in WELD mode.



2 Select DIRECT.

Press SET button a few times until LED for DIRECT is lit.

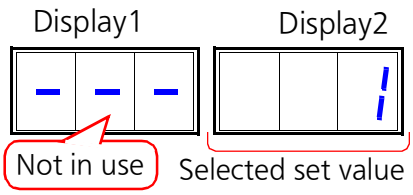
3 Allocate setting items

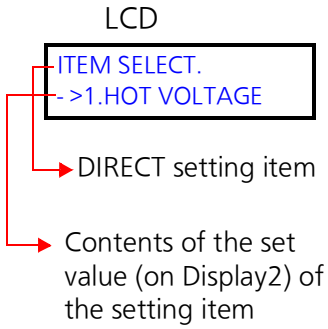
Long press SET button until LED for DIRECT blinks.

Turn Dial2 and select a setting item to allocate. (Setting range: 0 to 39)

0 to 39:
Weld parameters in DETAIL mode.

→ Display2 indicates the selected number.





4 Press ENTER button.

How to use DIRECT

(1) Press mode SELECT button, select WELD mode.

(2) With SET button, select DIRECT.
→ The allocated setting item is indicated on LED.

(3) Use Dial2 to fine-tune.

9. Maintenance

⚠ WARNING

Prior to working on internal parts, such as switching work, turn off power at the power distribution box and ensure safety. After the switching work, put the panels back in place.

♦ Do not touch any live parts. Otherwise, it may result in electric shock or death or serious injury.

To ensure human safety and stable arc, inspection should be conducted in the way suitable to individual work environment.
With daily check, do simple and quick check and with periodical check, check closely in every detail.

9.1 Daily inspection

- Daily inspection is very important to make the most of performance of the product and to ensure safety of daily operation.
- Check the items shown in the following table as daily check, and clean/replace parts if needed.
- As replacement parts, make sure to use our genuine parts for Panasonic welding machines to keep its performance and functions.

● **Welding power source (This product)**

Part	Check points
Front panel	• Check equipment, such as fuse holder, for wear or damage. • Check installation of equipment for looseness. • Check LEDs if they function (turns on/off) correctly. • Check if cooling fan rotates smoothly.
Rear panel	• Check equipment, such as fuse holder and jig for wear or damage. • Check if input cables are fixed with the saddle. • Check if input terminal cover is properly installed. • Check installation of equipment, such as fuse holder and jig, and covers for tightness. • Check if cooling fan functions correctly.
Peripheral	• Check installation of top panel and cases for looseness.
Overall	• Check appearance for any signs of tarnish or heat generation. • Check power source after turning power on or during welding operation for abnormal vibration, noise or odor.

● **Cables**

Part	Check points
Ground cable	• Check that input ground connections are secured at power source. • Check that ground connections are secured at base metal.
Input cable	• Check cable jackets for wear and damage. • Check that no heavy item is placed on the cable. • Check that terminal connections are secured at load side terminals of distribution box and at input terminals of power source.
Output power cable	• Check cable jackets for wear and damage. • Check conductive parts other than that of base metal if they are exposed. • Check that no heavy item is placed on the cable. • Check connections for looseness.
Control cable	• Check that connectors are properly connected. • Check cable jackets for wear and damage. • Check that no heavy item is placed on the cable.

9.2 Periodic inspection

⚠ CAUTION

T ensure safe inspection work, make sure to wear protective equipment properly.

- Improper handling of the product and crack of the plastic parts due to time degradation can cause physical injury.

Attention

Prior to touching a P.C. Board, discharge static electricity through metallic part, such as case. Otherwise, electric parts may damaged.

Attention

Handling plastic components
Plastic parts can be melt or deformed if it is exposed to an organic solvent such as benzine, toluene, gasoline and heating oil. To clean the parts, gently wipe them with a soft cloth lightly soaked in water or mild solution with neutral detergent and wring it.

- Only trained and/or skilled personnel who properly understand welding machine and electric circuit repair work should perform periodic inspection
- After completing welding operation, leave it at least five minutes to cool down the inside of the welding power source before performing internal inspection.
- Provide fence or the like to prevent any unauthorized personnel from entering in and around the welding work area carelessly.
- Daily inspection is not enough to maintain performance of the product for years.
- With periodic check, check closely in every details including internal check and cleaning.
- Perform the periodic check every sixth month. If the surrounding environment has fine dust and greasy fumes more than usual, perform the periodic inspection every third month.

9.3 Inspection items

⚠ CAUTION

Observe the following instructions to ensure safety.

- Only trained and/or skilled personnel who properly understand welding machine and electric circuit repair work should perform periodic inspection should perform inspection work.
- After completing welding operation, leave it at least five minutes to cool down the inside of the welding power source before performing internal inspection.
- Prior to removing the case, provide fence around the product or the like to prevent any personnel from coming close to the product carelessly.

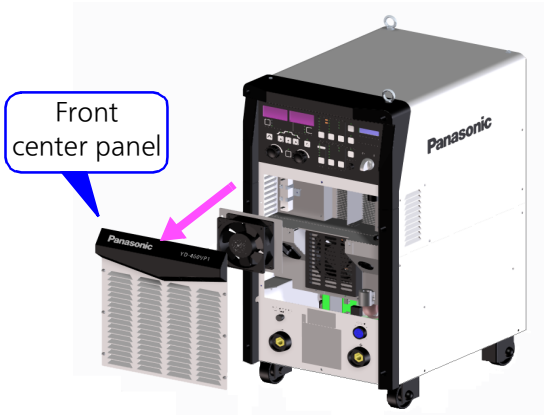
⚠ CAUTION

When blowing compressed air to the cooling fan, keep off rotation part of the cooling fan, otherwise hand, fingers, hair or part of my clothes may be caught by the rotating parts resulting in injury.

Here are standard check items. It is recommended to add check items of your own depending on work environment and usage.

9.3.1 Cleaning fin

As you use the product longer, the fin that promotes heat loss of semiconductor gets clogged causing temperature rise inside the product, resulting in temperature error stop. Therefore, periodic cleaning of fin is recommended.



(1) Remove the front center panel from the welding power source, and disconnect the cooling fan. And then remove the cooling fan together with mounting plate.

(2) Remove dirt and dust accumulated in the fin.

Note

After completing the inspection work, put the connector, mounting plate and front center panel back in place.

9.3.2 Removing dust in the product

It is recommended to perform periodic cleaning as dust and wire particles are prone to get into the product from the lower part of the product.

(1) Unscrew bolts from lower left and right panels (6 each) of the welding machine to remove the covers.

(2) Before blowing air, remove any items, such as dust and iron particles that may affect surroundings.

(3) Use dry compressed air to blow dirt and dust accumulated in the product.

Note

Make sure to put the cover back in place after inspection.

9.3.3 Overall inspection

Mainly check the following points.

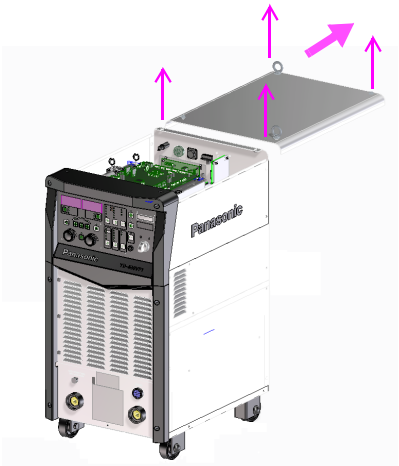
- Signs of odor, tarnish and heat generation
- Loose connections
- Over-tightening
- Items that are difficult to check in daily inspection

9.3.4 Checking cables and ground cable

1) Check input, output and base metal cables and ground cable

Refer to the inspection points of cables in the previous “Daily inspection” and check those points carefully.

9.3.5 How to remove top panel



(1) Unscrew two eyebolts and two bolts from the top panel to remove the top panel.

Note

- Before removing the top panel, remove dust and iron particles from the top panel if any.
- Remove the top panel only for internal inspection. Do not remove side plates to prevent dirt and dust to get into the power source.
- Compared to the lower part, the upper part of the power source is designed as less likely dirt and dust to get into it. Do not perform inspection work in dust-laden atmosphere, such as immediately after blowing off dust.
- After inspection work, make sure to put cover back in place.

9.3.6 Checking consumable

- Relay on the P.C. Board switches on/off the circuit using contact, which has certain electrical and mechanical service life. Cooling fan and electrolytic capacitor also have service life.
- Service life using under rated specification for cooling fan is about 60 000 hours, and for electrolytic capacitor is about 20 000 hours. Such service lives vary with usage. Handle them as consumable parts in inspection work.
  To secure safe use of the product, it is recommended to replace them with new ones based on the above mentioned service life.

9.3.7 Parts replacement

- For safety purpose, please contact Panasonic representatives in case of replacing parts inside the welding power source.
- As replacement parts, make sure to use our genuine parts for Panasonic welding machines to keep its performance and functions.

9.3.8 Precautions in performing withstand voltage test and insulation resistance measurement

This product uses semiconductor components, such as transistor. Executing withstand voltage test or insulation resistance measurement casually may cause serious physical injury or mechanical failure. If necessary, contact Panasonic representatives.

● **Attention to Panasonic representatives**
(About withstand voltage test and insulation resistance measurement)

Prior to conducting withstand voltage test and insulation resistance test, prepare the following items and also connect ground wire (cross section: about 1.25 mm^2).

Area	Operation
Input power cable	Draw out the input power cable from the power box, and short the connecting terminals of the cable.
Output terminal of welding power source	Disconnect the cables connected to the output terminal except one for welding main circuit, and then short-circuit the output terminals with conductor cable.
Connecting connector	Disconnect all connecting cables and signal wires for external devices from jig terminal, welding torch, wire feeder connector, communication connector and so on.
Ground wire for case	Disconnect all ground wires inside of the case connected to the case.
Main circuit	Short-circuit between the emitter and collector of the main transistor IGBT, and between anode and cathode of the secondary diode with conductor cable.
Control circuit	Disconnect all connectors connected to the P.C. Board.

Note

After completion of the test(s) and prior to re-installing the case or cover, do the following without fail.

- Remove all conductor cables for short-circuit.
- Reconnect all cables, connectors and ground wires that have been disconnected before the tests to the original condition.
- Make sure to conduct the above. If the power has been turned on without removing the conductor cables for the test, the equipment may be burnt.

10. Troubleshooting

⚠ WARNING

When the power (or breaker) is automatically shut off, contact Panasonic representatives for repair.
Reclosing the product can cause physical injury due to short circuit.

⚠ WARNING

Prior to working on internal parts, such as switching work, turn off power at the power distribution box and ensure safety. After the switching work, put the panels back in place.

- ♦ Do not touch any live parts. Otherwise, it may result in electric shock or death or serious injury.

⚠ CAUTION

T ensure safe inspection work, make sure to wear protective equipment properly.

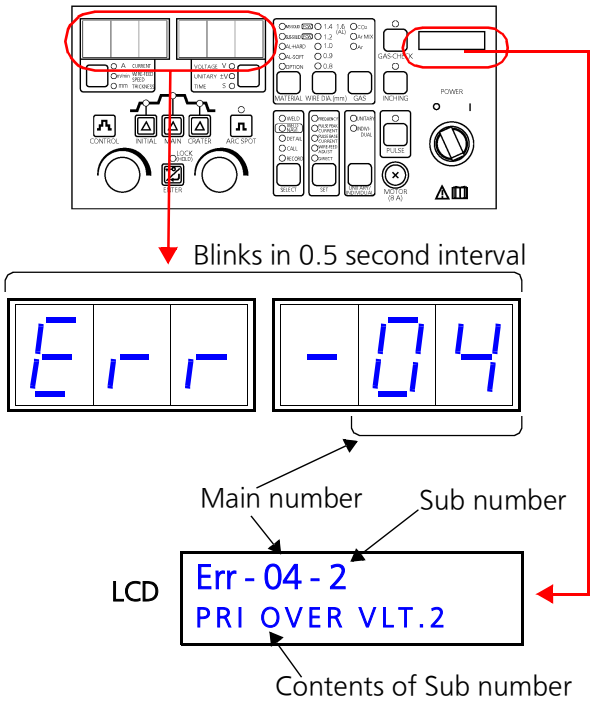
- ♦ Improper handling of the product and crack of the plastic parts due to time degradation can cause physical injury.

- Only qualified personnel who understand electrical knowledge should perform error handling.
- After completing welding operation, leave it for five minutes to discharge the capacitors.

10.1 Error No. indication

Some errors can apply self-diagnosis. Main and sub numbers of such error are indicated on Displays1 and 2 if occurred. (See the below figure)

<Example: Error 4-2>



- lass (Recovery classification)

A	The error indication is automatically turned off if the cause of the error is eliminated. * Automatic reclosing
B	The error indication remains blinking until power is turned off. * Required manual reclosing.

Main No.	LCD (Contents)	Sub No.	Class	Cause	Remedy
01	EMERGENCY STOP (Emergency stop)	-	B	Jig terminal received an emergency stop signal from an external device.	Remove the cause of the error in the external device. Then turn on the power switch again.
02	2nd OVER CURRENT (Secondary side over current error)	-	A	Over-current due to short circuit in the secondary circuit.	Turn off the torch switch, and then remove the cause of over-current.

Main No.	LCD (Contents)	Sub No.	Class	Cause	Remedy
03	ABNORMAL TEMP (Temperature rise error)	-	A	Rise in temperature inside this welding power source.	• Leave the power switch on to cool down inside the welding power source. • Remove the cause of the temperature rise, such as over duty cycle, foreign material near the side ventilators and the suction opening in the front panel, which may be blocking plates.
04	PRI OVER VLT. (Primary side over voltage error)	1-4	B	Input voltage exceeds the allowable upper limit.	Reduce the input voltage to within the allowable fluctuation range. Then turn on the power switch again.
05	PRI LOW VLT. (Primary side low voltage error)	1-8	B	Input voltage goes below the allowable lower limit.	Increase the input voltage to within the allowable fluctuation range.Then turn on the power switch again.
06	ARC START ERR. (Arc start error)	-	A	Failed to detect voltage at torch switch ON.	• Turn off welding output, wire feed motor and gas output. • Turn off the power switch and remove the cause of arc start error. • If “base metal voltage detection” wire is used, (a)check the detection wire for breaking or bad connection, (b)check the voltage detection method” setting. (Group-3: Sebmenu-20) (c)check the fuse of the voltage detection wire of the wire feeder.
07	START UP SIGNAL (Torch start error)	-	A	Torch switch remains in ON position.	Turn off the torch switch.
08	CURRENT DETECT (Current detection error)	-	B	Output current or output voltage is detected when the power switch was turned on.	• Turn off the power switch and investigate the cause of the error. (a) Welding power source failure (b)Voltage is applied from an external device to the secondary side of this welding power source.

Main No.	LCD (Contents)	Sub No.	Class	Cause	Remedy
10	EXTERNAL STOP1 (External temporary stop1)	-	A	Jig terminal received a temporary stop signal from an external device.	Remove the cause of the error in the external device.
11	EXTERNAL STOP2 (External temporary stop2)	-	A	Jig terminal received a temporary stop signal from an external device.	Remove the cause of the error in the external device.
17	422 TIME OUT (422 communication error)	1-4	B	Exceeded RS-422 connection time-out period	Turn power switch off and back on again.
27	MOTOR POWER ERR. (Motor power error)	1	B	An error in motor power source.	Turn off the power switch and investigate the cause of the error.
	ENCODER ERR. (Encoder detection error)	2		Failed to detect encoder signal of the motor.	
	MOTOR OVER CURR. (Motor over current error)	3		Over-current to the motor	
	MOTOR CURR.ERR. (Motor overload error)	4		Motor rotation frequency is low.	
60 | 62	— (Other 422 communication error)	-	B	Communication cable (or welding power source itself) is influenced by noise.	Review wiring work. (Lay cables, such as communication cable, away from the source of the noise.)
63 | 65	— (Other 232 communication error)	-	B	Communication cable (or welding power source itself) is influenced by noise.	Review wiring work. (Lay cables, such as communication cable, away from the source of the noise.)
82	IIF COM ERR (IIF unit connection error)	-	B	Error in connection with IIF unit(*).	Turn off the power switch and investigate the cause of the error.
83	EXP. Unit	-	B	Connection failure of the Welding Table Expansion Unit.	Turn off the power source, and then turn it on again. If this does not solve the problem, hold the MATERIAL button for 5 seconds or longer.

(*)The IIF unit is not applicable to this welding power source.

Note

If the error recurs frequently after taking the above remedy, contact Panasonic representatives.

10.2 When displays blink irregularly

If a phase of the three-phase input power source input becomes open (open phase), the seven-segment displays and LEDs blink irregularly.
Check input power system.

10.3 Troubleshooting Chart

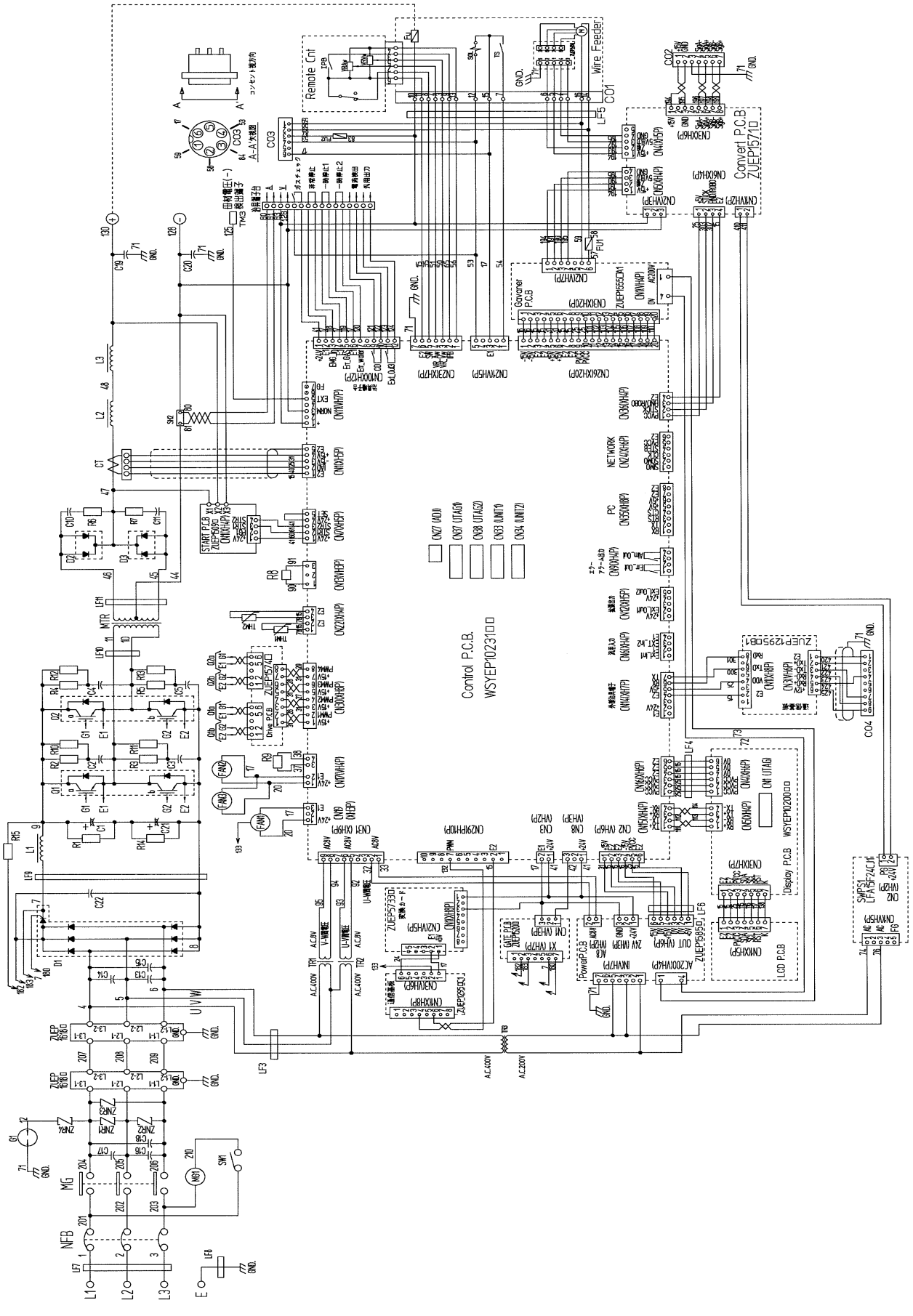
For errors, self-diagnosis is not available refer to the Troubleshooting chart.

In case of failure of peripheral components, contact Panasonic representatives for repair parts.

(O: Target check points.)

Check points			Error condition: No arc	No gas supply	No wire feeding	Poor arc start	Unstable arc	Bead turns black	Wire runs into the base metal	Welded tip	Blowholes
Input power cable		Cable: Break Connection (input terminal): Looseness	O	O	O						
This unit		Power switch: OFF, Trip	O	O	O						
Gas	Gas cylinder Gas regulator	Mail valve: Closed Gas: Shortage (No) Pressure, flow rate: Wrong settings Connection: Looseness		O			O				O
Gas	Gas hose	Gas hose: damage Connection: Looseness		O							O
Wire feeder		Feed roller, Wire guide: Wrong wire diameter Feed roller: Crack, Groove clogging Pressure rod: Improper settings Wire guide: wire dust buildup			O	O	O	O		O	
Torch cable		Breaks (for power and for torch switch) Poor connection to wire feeder Trace of heavy drop	O	O	O		O		O		
		Cable: piled coils, sharp bending				O	O	O		O	
Welding torch		Tip, Liner: Wrong wire diameter, abrasion, clogging, deform				O	O	O		O	
		Tip, Nozzle, Insulation tube: Looseness Poor connection to wire feeder						O			O
Base metal cable		Cable size: Insufficient (cross section area) Connection: Looseness Insufficient current supply to the base metal				O	O	O			
Welding conditions		Welding current, welding voltage, torch angle, speed, wire extension, etc. Waveform control, pulse characteristics: significant deviation.				O	O	O	O	O	
Base metal surface		Oil, dirt, rust, attachment of coating film				O	O	O	O		O

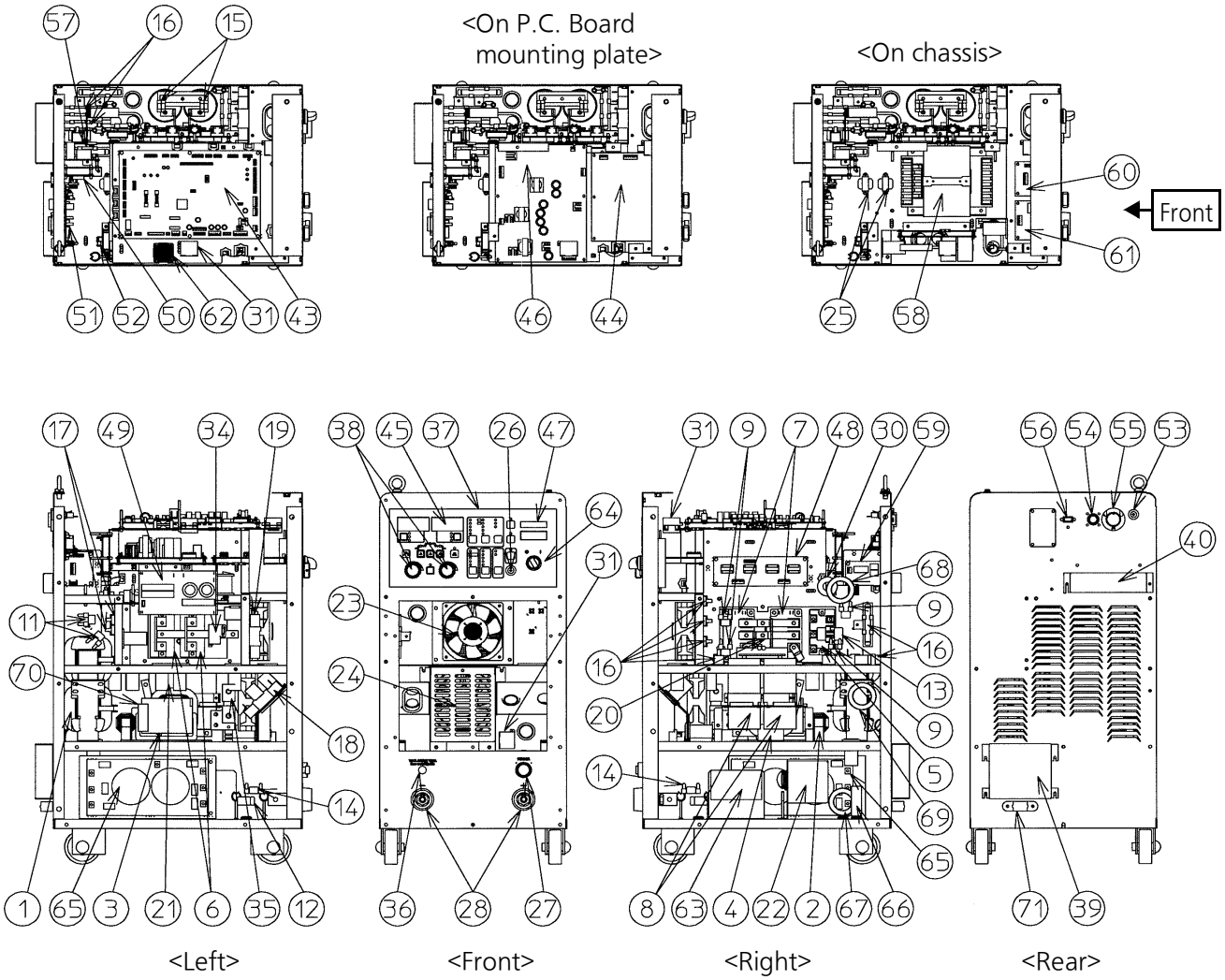
11. Circuit diagram

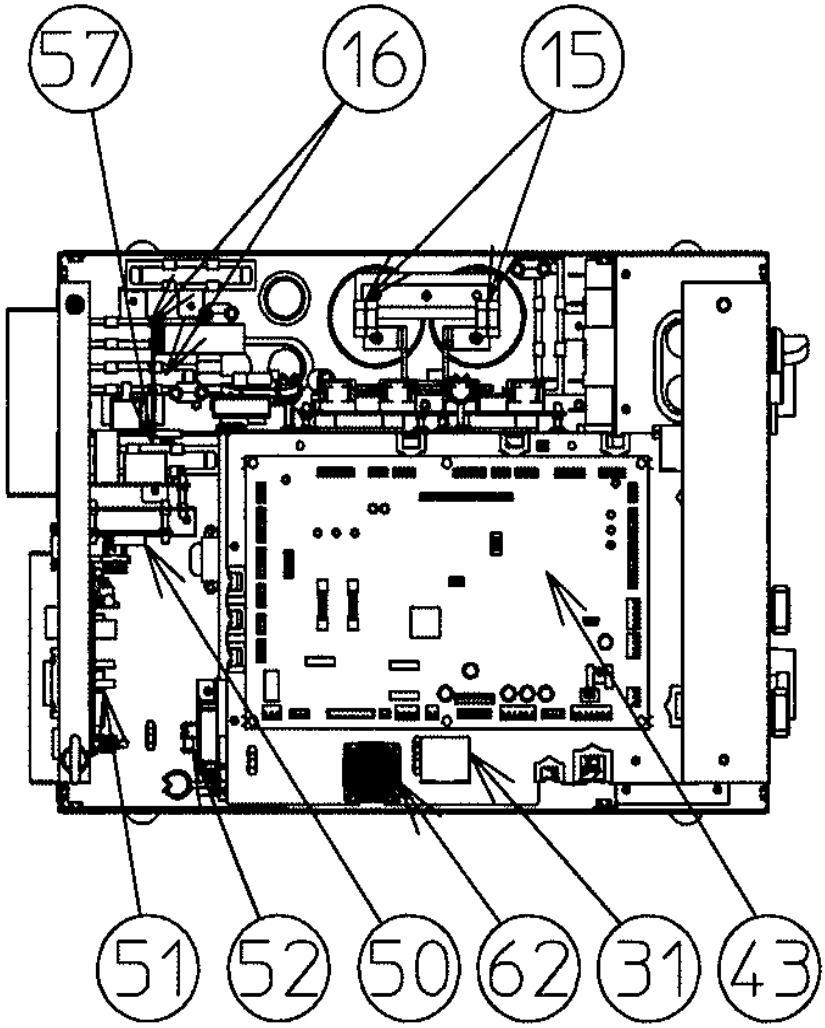


12. Parts list

To order a replacement part, please quote the "Part number".
The numbers in the No. column correspond to the circled numbers in the figures.

Note
The underline ("__") in a part number represents a given alphanumeric character, which does not affect compatibility.



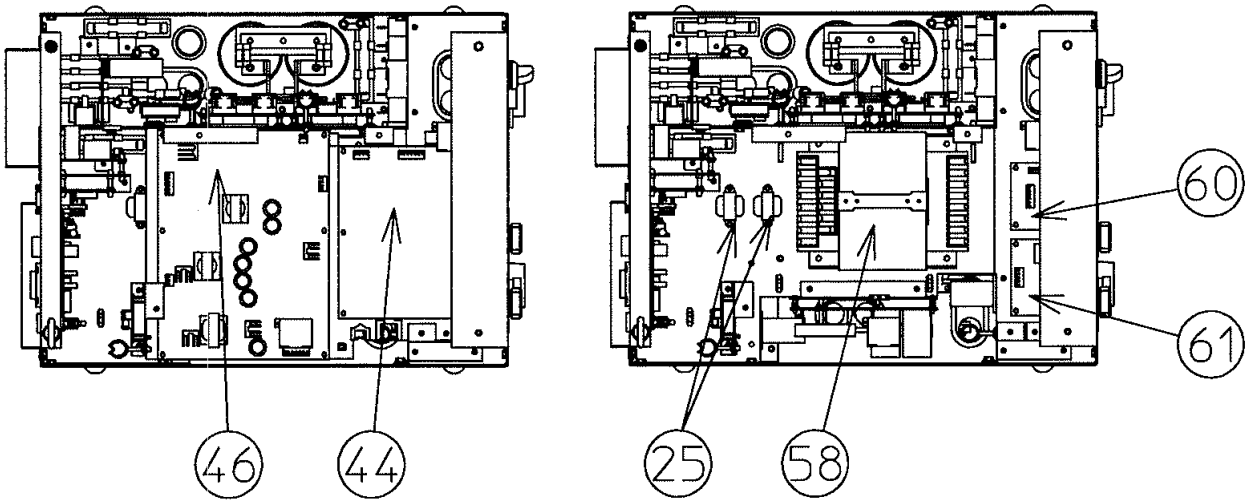


No.	Symbol	Part name	Part number	Internal code	Q'ty	Remarks
15	R1,R14	Resistor	CEX00083	CEX00083	2	
16	R2-R5, R10-R13	Resistor	YMAD112	SFW40E5R0AP	8	Interchangeable with 274H40W5R0JW
31	LF4,LF5, LF6	Ferrite core	YABD125	J0KG00000014	3	
43	ZUEP1	P.C. Board	WSYEP10254	WSYEP10254	1	Control board: ZUEP1588
50	ZUEP8	Communication board	ZUEP1295_B	ZUEP1295_B_	1	
51	ZUEP9	Conversion board	ZUEP1571	ZUEP1571_	1	
52	SWPS1	Switching power source	YCAD133	LFA15F24CJ1	1	
57	R15	Resistor	YMAD113	SFW40E501	1	
62	FAN3	Fan assy	WSDEX00021	WSDEX00021	1	Fan guard: KXFP6F9HA00

Lower/Upper boards

<On P.C. Board mounting plate>

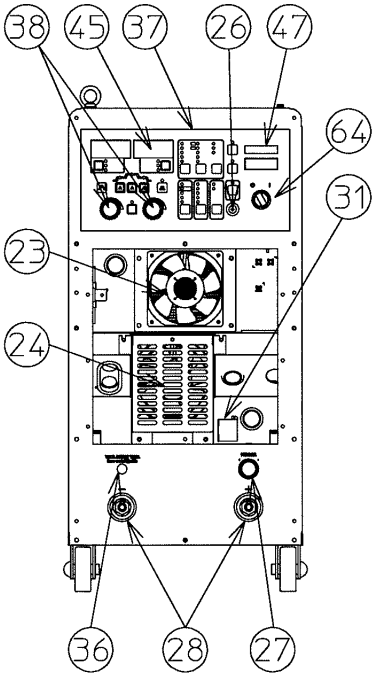
<On chassis>



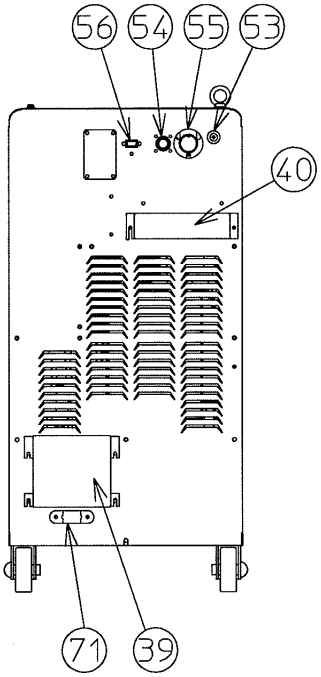
No.	Symbol	Part name	Part number	Internal code	Q'ty	Remarks
25	TR1,TR2	Control transformer	WSUTU22710	WSUTU22710	2	
44	ZUEP2	Governor board	ZUEP1555_A	ZUEP1555_A_	1	
46	ZUEP4	DC power source	ZUEP1585	ZUEP1585_	1	DC power board
58	TR3	Control transformer	WSUTU22700	WSUTU22700	1	
60	ZUEP11	Communication board	ZUEP1295_C	ZUEP1295_C_	1	
61	ZUEP12	Conversion board	ZUEP5733_A	ZUEP5733_A_	1	

Front / Rear

<Front>

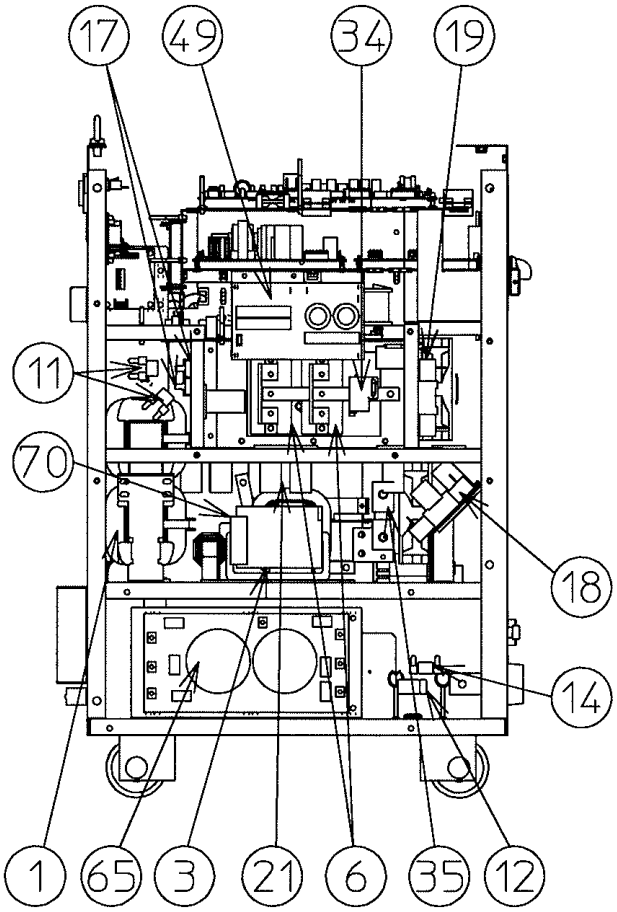


<Rear>



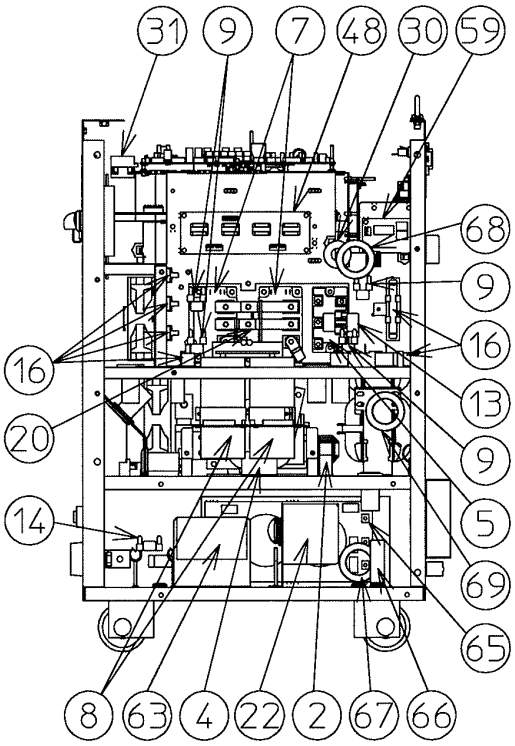
No.	Symbol	Part name	Part number	Internal code	Q'ty	Remarks
23	FAN1	Fan motor	MTND000114AA	MTND000114AA	1	Fan guard: MG12FG
24	FAN2	Fan motor	YMAD145	9WG1224J103	1	
26	FU1	Fuse	BET6.3A	BET6.3A	1	Safety part For motor (6.3 A) Fuse holder: MTNE000564AA
27	CO1	Connector	WSDEX00027	JMR2516FD	1	Available in sets with metal plug harness (WSDEX00027)
28		Output terminal	YMAD55	D1XBE70/95	2	
36	TM3	Ring terminal	T375-12B	T375-12B	1	Base metal voltage detection terminal
37		Operation sheet	WSDHS00016	WSDHS00016	1	
38		Knob	TSMH0062	TSMH0062	2	
39		Terminal block	N510012056AA	N510012056AA	1	Input terminal cover : (Outside) WSDKK008TA (Inside) WSDEK00009 (Maker's No. OTB-358N-4PTUV)
40		Terminal block	MTNE000339AA	MTNE000339AA	1	Jig terminal cover: DKK00105
45	ZUEP3	P.C. Board	WSYEP10200	WSYEP10200	1	Operation board: ZUEP1597
47	ZUEP5	Liquid crystal module	MTNS000066AA	MTNS000066AA	1	Liquid crystal board
53	FU2	Fuse	YMAD81	BET3.15A	1	Safety part For voltage detection (3.15 A) Fuse holder: MTNE000564AA
54	CO2	Connector	DWX01084-__	JMR1607F	1	Available in sets with metal plug harness (DWX01084-__)
55	CO3	Metal plug	MT25B6YP	MT25B6YP	1	
56	CO4	Connector	WSDWX00074	DE9SFN	1	Available in sets with D-SUB harness (WSDWX00074)
64	SW1	Switch	MTNS000684AA	MTNS000684AA	1	Contact unit: MTNE000526AA
71		Saddle	YCAD125	DS1625	1	Rubber cover: MFG50129-02

Left side



No.	Symbol	Part name	Part number	Internal code	Q'ty	Remarks
1	MTR	Main transformer	WSDTU00008ZZ	WSDTU00008ZZ	1	
3	L2	CL	DLU00173	DLU00173	1	
6	D2,D3	Diode	YMAD219	B0FFQR000001	2	(Maker's No.: PC300FN61)
11	C10,C11	Capacitor assy	WSDEX00002	WSDEX00002	2	
12	C16-C18 ZNR1-4, G1	ZNR assy	WSDEX00008	WSDEX00008	1	
14	C19,C20	Capacitor assy	WSDEX00001	WSDEX00001	2	
17	R6,R7	Resistor	YMAD112	SFW40E5R0AP	2	Interchangeable with 274H40W5R0JW
18	R8	Resistor	YZA97	SFW40E101J	1	
19	R9	Resistor	YRAD61	SFW40E3R3J	1	
21	THM2	Thermistor	WSDWX00080	WSDWX00080	1	Safety part
34	CT	CT	YCA6	TN300A4VB15A	1	
35	SH2	Shunt	MSH600A	MSH600A	1	Interchangeable with HY600A
49	ZUEP7	Start board	ZUEP1509	ZUEP1509_	1	
65	ZUEP13, ZUEP14	Filter board	ZUEP1618	ZUEP1618_	2	Noise filter board
70	LF11	Ring core	YZAD209	HF90T622439	1	MTR Secondary side

Right side

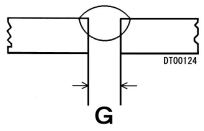


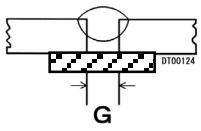
No.	Symbol	Part name	Part number	Internal code	Q'ty	Remarks
2	L1	FCH	DLU00196	DLU00196	1	
4	L3	DCL	WSDLU00003ZZ	WSDLU00003ZZ	1	
5	D1	Diode	B0KZ00000012	B0KZ00000012	1	(Maker's No.: DFA150BA160)
7	Q2,Q3	IGBT	B1JZMV000003	B1JZMV000003	2	(Maker's No.: CM200DU-24NFH)
8	C1,C21	Capacitor	YABD237	LXA401LGC472	2	
9	C2-C5	Capacitor assy	WSDEX00007	WSDEX00007	4	
13	C13-C15	Capacitor assy	WSDEX00010	WSDEX00010	1	
14	C19,C20	Capacitor assy	WSDEX00001	WSDEX00001	2	
16	R2-R5, R10-R13	Resistor	YMAD112	SFW40E5R0AP	8	Interchangeable with 274H40W5R0JW
20	THM1	Thermistor	WSDWX00081	WSDWX00081	1	Safety part
22	NFB	No fuse breaker	YMAD199	DCP73BH60AMS	1	Safety part Breaker cover: PEK00018
30	LF3	Ring core	YCA35	ESDR38C1	1	
31	LF4,LF5 LF6	Ferrite core	YABD125	J0KG00000014	3	
48	ZUEP6	Driver board	ZUEP1574	ZUEP1574_	1	
59	ZUEP10	Gate board	ZUEP1520	ZUEP1520_	1	SCR gate board
63	MG1	Magnet switch	MTNC000774AA	MTNC000774AA	1	Safety part
65	ZUEP13, ZUEP14	Filter board	ZUEP1618	ZUEP1618_	2	Noise filter board
66	LF7	Ring core	YMA39	E04RC613620	1	Noise filter: WSDEX00022
67	LF8	Ring core	YZAD209	HF90T622439	1	Noise filter: WSDEX00023
68	LF9	Ring core	YZAD209	HF90T622439	1	Noise filter: WSDEX00024
69	LF10	Ring core	YMA39	E04RC613620	1	MTR Primary side

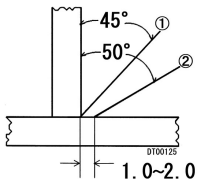
13. Welding conditions table (Reference)

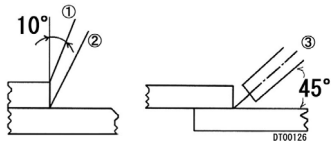
The following are rough indications of standard welding conditions as reference data. In actual welding operation, it is necessary to set values in consideration of shape of the workpiece, welding position and so on.

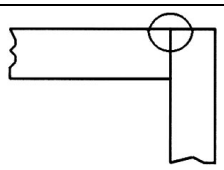
13.1 CO_2 welding conditions table: Solid wire (Reference)

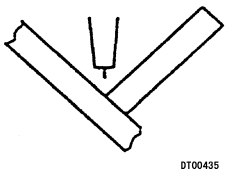
Butt joint welding (Square groove joint) (At low-speed)							
Thickness (mm)	Wire diameter (mm)	Root gap G (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Gas flow (L/min)
0.8	0.8, 0.9	0	60-70	16-16.5	0.50-0.60	10	10
1.0	0.8, 0.9	0	75-85	17-17.5	0.50-0.60	10	10-15
1.2	0.8, 0.9	0	80-90	17-18	0.50-0.60	10	10-15
1.6	0.8, 0.9	0	95-105	18-19	0.45-0.50	10	10-15
2.0	1.0, 1.2	0-0.5	110-120	19-19.5	0.45-0.50	10	10-15
2.3	1.0, 1.2	0.5-1.0	120-130	19.5-20	0.45-0.50	10	10-15
3.2	1.0, 1.2	1.0-1.2	140-150	20-21	0.45-0.50	10-15	10-15
4.5	1.0, 1.2	1.0-1.2	170-185	22-23	0.40-0.50	15	15
6.0 Front	1.2	1.2-1.5	230-260	24-26	0.40-0.50	15	15-20
6.0 Back	1.2	1.2-1.5	230-260	24-26	0.40-0.50	15	15-20
9.0 Front	1.2	1.2-1.5	320-340	32-34	0.40-0.50	15	15-20
9.0 Back	1.2	1.2-1.5	320-340	32-34	0.40-0.50	15	15-20

Butt joint welding (Square groove joint) (With backing)								
Thickness (mm)	Wire diameter (mm)	Root gap G (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Gas flow (L/min)	Copper backing
0.6	0.6	0	40	16	0.60	10	15-20	Thickness: 3.2 mm-6 mm
0.8	0.6	0	40	16.5	0.45	10	15-20	
	0.8	0	80-90	18-19	0.45-0.50	10	15-20	
1.0	0.9	0	50	18	0.45	15	15-20	
1.2	0.8	0	60	18	0.45	15	15-20	
	0.9	0-0.5	90-120	19-20	0.40-0.50	10	15-20	
1.6	0.9	0	95-105	18-19	0.45-0.50	10	15-20	
	1.2	0-0.5	120-140	19-20	0.40-0.50	10	15-20	
2.3	0.9	0-0.8	100-140	19-21	0.35-0.45	10	15-20	Thickness: 6 mm-8 mm Groove depth: 1 mm-2 mm
	1.2	0-1.2	130-150	19-21	0.35-0.45	10	15-20	
3.2	1.2	0-1.5	130-180	20-23	0.30-0.35	10-15	15-20	
4.5	1.2	1-2	150-200	21-24	0.40-0.45	10-15	15-20	
6.0	1.2	0-0.8	280-330	28-36	0.35-0.45	15-20	15-20	Thickness: 12mm or more Groove depth: 3 mm
	1.6	0-0.8	380-420	37-38	0.40-0.45	15-20	15-20	
9.0	1.2	0-0.8	320-340	32-34	0.40-0.50	15-20	15-20	

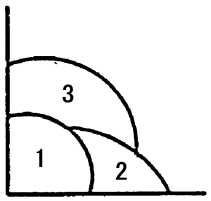
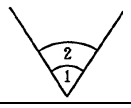
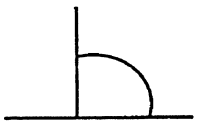
Fillet welding (Horizontal position)								
(At low-speed)								
Thickness (mm)	Leg length (mm)	Wire diameter (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Position (1)/(2)	Gas flow (L/min)
1.0	2.5-3	0.8, 0.9	70-80	17-18	0.50-0.60	10	(1)	10-15
1.2	3-3.5	0.9, 1.0	85-90	18-19	0.50-0.60	10	(1)	10-15
1.6	3-3.5	1.0, 1.2	100-110	18-19.5	0.50-0.60	10	(1)	10-15
2.0	3-3.5	1.0, 1.2	115-125	19.5-20	0.50-0.60	10	(1)	10-15
2.3	3-3.5	1.0, 1.2	130-140	19.5-21	0.50-0.60	10	(1)	10-15
3.2	3.5-4	1.0, 1.2	150-170	21-22	0.45-0.50	15	(1)	15-20
4.5	4.5-5	1.0, 1.2	180-200	23-24	0.40-0.45	15	(1)	15-20
6	5-5.5	1.2	230-260	25-27	0.40-0.45	20	(1)	15-20
8,9	6-7	1.2, 1.6	270-380	29-35	0.40-0.45	25	(2)	20-25
12	7-8	1.2, 1.6	300-380	32-35	0.35-0.40	25	(2)	20-25

Lap Joint (Fillet)							
(At low-speed)							
Thickness (mm)	Wire diameter (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Position (1)/(2)/(3)	Gas flow (L/min)
0.8	0.8, 0.9	60-70	16-17	0.40-0.45	10	(1)	10-15
1.2	0.8, 0.9	80-90	18-19	0.45-0.50	10	(2)	10-15
1.6	0.8, 0.9	90-110	19-20	0.45-0.50	10	(2)	10-15
2.3	0.8, 0.9	100-130	20-21	0.45-0.50	10	(3)	10-15
	1.0, 1.2	120-150	20-21	0.45-0.50	10	(3)	10-15
3.2	1.0, 1.2	150-180	20-22	0.35-0.45	10-15	(3)	10-15
4.5	1.2	200-250	24-26	0.40-0.50	10-15	(3)	10-15

Corner Joint (Fillet)						
(At low-speed)						
Thickness (mm)	Wire diameter (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Gas flow (L/min)
1.6	0.8, 0.9	65-75	16-17	0.40-0.45	10	10-15
2.3	0.8, 0.9	80-100	19-20	0.40-0.45	10	10-15
3.2	1.0, 1.2	130-150	20-22	0.35-0.40	10-15	10-15
4.5	1.0, 1.2	150-180	21-23	0.30-0.35	10-15	10-15

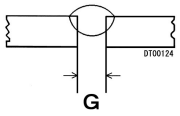
Fillet welding (Flat position)	 DT00435						
Thickness (mm)	Leg length (mm)	Wire diameter (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Gas flow (L/min)
1.0	3	0.9	60-65	16-17	0.30	10	10-15
1.2	3-3.5	0.9	70-80	17-18	0.40-0.50	10	10-15
1.6	3.5-4	0.9	90-130	19-20	0.40-0.50	10	10-15
2.3	4-4.5	1.2	120-160	20-21	0.40-0.45	10	10-20
3.2	4-5	1.2	150-200	21-25	0.35-0.45	10-15	10-20
4.5	6-6.5	1.2	270-300	28-30	0.40-0.45	15-20	10-20
6	4-4.5	1.2	300-330	30-35	0.60-0.70	15-20	10-20
	6-7	1.2	300-350	30-36	0.40-0.45	15-20	10-20
	6	1.6	380-400	37-38	0.45-0.50	15-20	10-20
8	6	1.2	300-350	30-36	0.40-0.45	15-20	10-20
	8-9	1.6	430-480	38-42	0.40-0.45	15-20	10-20
12	10	1.6	430-480	38-42	0.30-0.40	15-20	10-20
	12-13	1.6	450-480	38-42	0.25-0.30	20-25	10-20

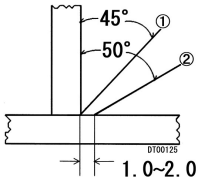
Flux Cored Wires (FCW)

Type	Welding position	Wire diameter (mm)	Leg length (mm)	Pass	Current (A)	Voltage (V)	Speed (m/min)	Weaving
Metal	 DT00438 Horizontal position	1.2	6	1	270	28	0.42	Without
			9	1	270	28	0.24	With
			12	1	280	29	0.34	Without
				2	280	29	0.36	Without
				3	280	28	0.45	Without
		1.4	9	1	330	31	0.28	With
			12	1	330	31	0.40	Without
				2	330	31	0.42	Without
				3	330	30	0.50	Without
Titania		1.2	9	1	270	28	0.25	Without
			12	1	300	31	0.35	Without
				2	300	31	0.29	With
Titania	 Horizontal position	1.2	4	-	220	27	0.70	-
			6	-	270	29	0.50	-
			8	-	300	30	0.35	-
		1.4	4	-	260	28	0.70	-
			6	-	320	31	0.50	-
			8	-	350	33	0.35	-
	Vertical position	1.2	4	-	180	22	0.50	-
			6	-	200	23	0.50	-
			8	-	220	23	0.45	-

13.2 MAG Welding Conditions Table: Solid wire (Reference)

- MAG gas: 80% Ar and 20% CO2

Butt joint welding (Square groove joint) (At low-speed)							
Thickness (mm)	Wire diameter (mm)	Root gap G (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Gas flow (L/min)
0.4	0.4	0	20	15	0.40	10	10
0.6	0.4, 0.6	0	25	15	0.30	10	10
0.8	0.6, 0.8	0	30-40	15	0.40-0.55	10	10
1.2	0.8, 0.9	0	60-70	15-16	0.30-50	10	10-15
1.6	0.8, 0.9	0	100-110	16-17	0.40-0.60	10	10-15
3.2	0.8-1.2	1.0-1.5	120-140	16-17	0.25-0.30	15	10-15
4.0	1.0, 1.2	1.5-2.0	150-160	17-18	0.20-0.30	15	10-15

Fillet welding (Horizontal position) (At low-speed)								
Thickness (mm)	Leg length (mm)	Wire diameter (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Position (1)/(2)	Gas flow (L/min)
0.6	2	0.4, 0.6	30-40	14	0.40-0.50	10	(1)	10-15
1.0	2-2.5	0.6, 0.8	40-60	14-15	0.40	10	(1)	10-15
1.6	3	0.6, 0.8	40-60	14-15	0.40-0.55	10	(1)	10-15
2.4	3.5	0.8-1.0	110-120	16-17	0.35-0.40	10	(1)	10-15
3.2	4	0.8-1.2	120-135	17-18	0.30-0.35	15	(1)	15-20

13.3 MIG welding conditions table: Stainless steel (Reference)

Wire diameter: 1.0 mm

Joint type	Thickness (mm)	Root gap (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Gas flow (L/min)
Butt joint (I-shape)	1.6	0	80-100	16-18	0.50	13	13
	2.0		90-110	16-18			
Corner or TJoint	1.6	0	80-100	16-18	0.40	10	10
	2.0		100-120	16-18			

Wire diameter: 1.2 mm

Joint type	Thickness (mm)	Root gap (mm)	Current (A)	Voltage (V)	Speed (m/min)	Tip-to-work distance (mm)	Gas flow (L/min)
Butt joint (I-shape)	3.2	0	150-170	18-19	0.50	15	15
	4.5		220-240	22-25			
	6.0		280-300	28-30	0.40	20	20
	9.0		280-330	28-32			
Corner or TJoint	2.3	0	140-170	18-20	0.50	15	15
	3.2		180-220	21-24			
	4.5		220-240	22-25	0.40	20	20
	6.0		250-300	25-30			

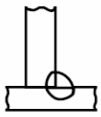
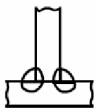
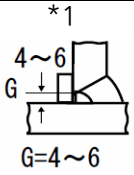
13.4 Aluminum MIG welding conditions table (Reference)

- In aluminum MIG welding, poor shielding or arc off error may occur depending on welding conditions, such as, gas flow rate and material of the base metal. Make sure to specify appropriate welding conditions, that is, set the torch angle at welding to “angle of advance”, adjust the gas flow rate to appropriate value and perform test welding to determine appropriate conditions for the applied material of the base metal.

13.4.1 MIG welding on aluminum

Wire: Hard aluminum A5356

	Posture	Thickness (mm)	Wire diameter (mm)	Root gap (mm)	Welding current (A)	Welding voltage (V)	Welding speed (cm/min)	Tip-to-work distance (mm)	Argon gas flow (L/min)
Butt Joint Welding	Flat	2.0	1.2	0	80	18	80	15	15
			1.2		90	18	110	15	15
		3.0	1.2	0	100	20	60	15	20
			1.2		140	22	100	15	20
		6.0	1.6	0	180	23	60	15	25
			1.6		220	24	90	18	25
		10.0	1.6	0	300	27	30	22	25
			1.6		300	28	50	22	25

	Posture	Thick-ness (mm)	Groove shape	Leg length (mm)	Number of pass	Wire diameter (mm)	Welding current (A)	Welding voltage (V)	Welding speed (cm/min)	Argon gas flow (L/min)
Fillet Welding	Horizontal	3		5-7	1	1.2	120-140	21-23	70-80	16-18
		4		5-8	1	1.2 or 1.6	160-180	22-24	35-50	16-18
		6		6-8	1	1.6	220-250	24-26	50-60	16-24
		8		8-9	1	1.6	250-280	25-27	40-55	20-28
		8		------	2-4	1.6	240-270	24-26	55-60	20-28
		10		------	4-6	1.6	250-280	25-27	50-60	20-28
		12		------	4-6	1.6	270-300	25-27	45-60	20-28
		8		------	2	1.6	240-270	24-26	40-60	20-28
		10		------	2	1.6	290-320	25-27	45-50	20-28
		12		------	3	1.6	290-320	25-27	50-60	20-28

13.4.2 DC pulsed MIG welding on aluminum

Hard aluminum wire: A5356, Base metal: A5052

	Posture	Thickness (mm)	Wire diameter (mm)	Welding current (A)	Welding voltage (V)	Welding speed (cm/min)	Tip-to-work distance (mm)	Argon gas flow (L/min)
Butt Joint Welding	Flat	1.2	1.2	60-70	17-18	50-60	10-12	15-17
		1.5		80-90	18-19	50-60	10-12	15-17
		2.0		90	18-19	50-60	10-12	15-17
		3.0		110-150	19-21	40-50	12-15	17-20
		4.0		180-200	21-22	40-50	12-15	17-20
Fillet Welding	Horizontal	1.2		60-70	16-17	40-50	10-12	15-17
		1.5		80-90	17-18	40-50	10-12	15-17
		2.0		100-110	17-18	40-50	10-12	15-17
		3.0		140-150	19-20	40-50	12-15	17-20
		4.0		190-200	21-22	40-50	12-15	17-20

13.5 Arc Spot Welding Conditions Table (Reference) CO_2 gas

Thickness (TopxBottom) (mm)	Wire diameter (mm)	Welding time (s)	Current (A)	Voltage (V)	Bead diameter (mm)	Tip-to-work distance (mm)	Gas flow (L/min)
0.6 x 0.6	0.6	0.5-0.75	100	22-24	8	10	12
0.6 x 0.6	0.8	0.75-1.0	95	22	7	12	12
0.8 x 0.8	0.6	1.25-1.5	100	22-24	10	10	12
0.8 x 0.8	0.8	0.5-0.75	130	22-24	9	12	12
1.0 x 1.0	0.8	1.25-1.5	155	24-26	12	12	12
1.0 x 1.0	1.2	0.25	260	25	10	-	16-20
1.2 x 1.2	0.8	1.75	155	24-26	12	12	12
1.2 x 2.3	1.6	0.6	320	25	-	15	16-20
1.2 x 3.2	1.2	0.35	320	24-26	15	-	16-20
1.2 x 3.2	1.6	0.6	350	31	-	15	16-20
1.2 x 6.0	1.6	1.1	390	32	-	15	16-20
1.6 x 1.6	1.2	0.8	320	32	16	-	16-20
1.6 x 2.3	1.6	0.6	340	33	-	15	16-20
1.6 x 3.2	1.6	0.7	370	32	-	15	16-20
1.6 x 6.0	1.6	0.7	460	32	-	15	16-20
2.3 x 2.3	1.6	1.0	380	33	-	15	16-20
2.3 x 3.2	1.6	2.0	480	35	-	15	16-20
3.2 x 3.2	1.6	0.5	500	35	17	-	16-20
3.2 x 4.5	1.6	1.5	400	22	-	15	16-20
4.5 x 4.5	1.6	1	550	37	22	-	16-20

14. Welding condition recording sheet

- It is recommended to keep a note of the user-created welding conditions for your convenience.
- Those user-create welding conditions can be saved in this unit by allocating a channel number to each of them.
- Copy and use the following “Channel list” to register the saved set contents.
- For welding conditions and channel number, see section “8.9 CALL” on page 120, and “8.8 RECORD” on page 117.
- For Advanced (welding) parameters, see section “8.3 DETAIL” on page 82.

Channel (CH) number	Material to be welded	Remarks	Prepared on	Prepared by

WELDING CONDITIONS

	INITIAL	WELD	CRATER	SPOT TIME	WAVEFORM CONTROL
Current	(A)	(A)	(A)	(s)	
Voltage	(±) · (V)	(±) · (V)	(±) · (V)		

ADVANCED settings (Functions)

Item	Settings
00 (RUN-IN SPEED)	
01 (HOT VOLTAGE)	
02 (FTT LEVEL)	
03 (BURNBACK TIME)	
04 (PENETRATION)	
05 (PRE-FLOW TIME)	
06 (POST-FLOW TIME)	
07 (PULSE PEAK CUR.)	
08 (PULSE BASE CUR.)	
09 (PULSE RISE CUR.)	
10 (PULSE FALL CUR.)	
11 (WFS FINE ADJ)	
13 (WAVE CONTROL 1)	

Item	Settings
14 (PULSE FREQ.)	
17 (PULSE WIDTH)	
18 (CRATER DC)	
19 (INIT PLS DC)	
20 (LOW PULSE SET)	
21 (LOW PULSE CUR)	
22 (LOW PULSE VOL.)	
23 (LOW PULSE FREQ.)	
24 (LOW PULSE DUTY)	
25 (LOW PULSE DELAY)	
30 (DISPLAY TIME)	
32 (PENET INC.)	

CONTROL settings

Item	Settings
CONTROL TYPE	• CRATER OFF/ON • INI.&CRATER OFF/ON • ARC SPOT

MATERIAL/WIRE DIA./GAS settings

MATERIAL	WIRE DIA. (mm)	GAS
MS-SOLID MS-FCW SUS SUS-FCW AL-HARD AL-SOFT	0.8 0.9 1.0 1.2 1.4 1.6	CO_2 MAG MIG PULSE MAG PULSE MIG

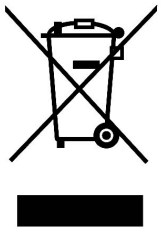
Channel List

Channel (CH) number	Material to be welded	Prepared on	Prepared by

Channel (CH) number	Material to be welded	Prepared on	Prepared by

15. Information on Disposal

Information on Disposal for Users of Waste Electrical & Electronic Equipment (private households)



This symbol on the products and/or accompanying documents means that used electrical and electronic products should not be mixed with general household waste.

Please dispose of this item only in designated national waste electronic collection schemes, and not in the ordinary dust bin.

For business users in the European Union

If you wish to discard electrical and electronic equipment, please contact your dealer or supplier for further information.

Information on Disposal in other Countries outside the European Union

This symbol is only valid in the European Union.
If you wish to discard this product, please contact your local authorities or dealer and ask for the correct method of disposal.

パナソニック スマートファクトリーソリューションズ株式会社
〒571-8502　大阪府門真市松葉町 2 番 7 号

Panasonic Smart Factory Solutions Co., Ltd.
2-7 Matsuba-cho, Kadoma City, Osaka 571-8502, Japan

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